DESIGN TRAFFIC FORECASTING MANUAL

DECEMBER 1, 2016

Georgia Department of Transportation

Atlanta, Georgia 30308

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SECTION 1: INTRODUCTION

One of the most important responsibilities of the Georgia Department of Transportation (GDOT) is overseeing the analysis of the need for proposed transportation projects throughout the State. One of the key factors in the decision to implement transportation system improvements is a sound technical analysis of the current and forecasted future levels of traffic to be served by the proposed project, including its special characteristics.

Prior to 2016, GDOT's technical guidance on its design traffic forecasting process and its requirements was included in the Department's Design Policy Manual. This document is GDOT's first stand-alone guidance document related to design traffic forecasts. This guidance explains the overall analysis process, the roles and responsibilities of those engaged in design traffic forecasting, and the required deliverables and their formats to be produced by the transportation professionals responsible for these activities. This document also includes appendices and sample graphics to assist Office of Planning design traffic personnel, design traffic forecasting professionals, and GDOT project managers in the traffic forecasting process.

For any proposed transportation improvement, the analysis of current and forecasted future traffic conditions is a critical input to the project development process. The traffic data and traffic forecasting activities performed during the project development process are vital for determining the nature, physical characteristics, and extent of the proposed project to address mobility needs. This document provides guidance on the requirements, standards, processes, methods, procedures, and formats for the design traffic forecasting process for both federal-aid projects and projects that are delivered by state and/or local funds.

At this time, GDOT projects funded with the proceeds of the Transportation Investment Act (TIA) are not subject to design traffic forecasting requirements; however, design traffic forecasting practitioners ("consultants") and GDOT personnel should be aware that there may be a policy change in this regard in the future.

Supplemental data, information, and graphics related to the design traffic forecasting process can be found in the appendices located at the end of this document. This manual is organized as follows:

Section 2: Introduction to Design Traffic Forecasting
Section 3: Overview of Design Traffic Forecasting Process
Section 4: Traffic Data Analysis for Design Traffic Forecasts
Section 5: Design Traffic Forecasting Process, Standards, and Documentation
Section 6: Design Traffic Forecasting Tools and Conventions
Section 7: Required Standards and Formats for Design Traffic Deliverables
Section 8: Design Traffic Reviews

It should be noted that this manual will be updated by GDOT on a periodic basis. The current version of the Design Traffic Forecasting Manual can be obtained from the GDOT's website.

SECTION 2: INTRODUCTION TO DESIGN TRAFFIC FORECASTING

This document has recently undergone a comprehensive review and update as part of a joint GDOT-consultant community collaboration through the Georgia Partnership for Transportation Quality (GPTQ) to clarify the design traffic analysis process and requirements. The update of this document, which occurred during 2015 and 2016, involved extensive stakeholder outreach and technical input from the GPTQ Traffic Forecasting Task Force and GDOT Office of Planning's design traffic forecasting staff.

This manual is intended to provide a clear description of the traffic forecasting process and requirements for GDOT design traffic personnel, GDOT project managers, and consultants to navigate the design traffic-related requirements for developing GDOT-led projects, regardless of the funding source. This guidance also provides information on the roles and responsibilities of the GDOT Project Manager, the Office of Planning's design traffic personnel, and the project consultant. ***If there is an exceptional situation that is not anticipated or covered in this document, please contact the GDOT Office of Planning's design traffic group for assistance.***

It is critically important that the GDOT and consultant project managers as well as the consultant's Traffic Forecasting Engineer (TFE), the transportation professional responsible for the design traffic analysis and forecasting activities, fully understand GDOT's requirements for these activities as early as possible in the project development process. This knowledge should guide project scoping decisions by both GDOT and the consultants, thereby reducing delays in project delivery, which is one of GDOT's primary goals.

2.1 Application of Design Traffic Requirements

The design traffic forecasting requirements described in this document apply to any type of engineering design effort, including, but not limited to, those located at or along freeways and other roadways; intersections; interchanges; bridges, other structures, and related facilities; traffic signal operations; traffic management systems; multimodal transportation (i.e. bicycle, pedestrian, or trail, etc.) improvements; and unconventional design concepts, such as roundabouts, diverging diamond interchanges (DDI), quadrant roadway (QR) intersections, etc. Please refer to Section 3 (Table 2), which identifies the level of analysis required to meet design forecasting requirements.

Consultants responsible for overall project delivery should involve their traffic engineering professionals early in the project development process, as forecasted traffic volumes and related information are important factors in determining the project's logical termini (LT), a key aspect of the project's design as well as the project's overall justification.

2.2 The "Traffic Forecasting Engineer"

GDOT undertakes a wide array of projects of varying types, extents, and funding sources with project partners that include GDOT consultants, local governments, other state agencies, and consultants hired by local governments. ***For the purposes of this document, the term "Traffic Forecasting Engineer" (TFE) is used to identify the person who is responsible for interacting with the GDOT Project Manager and the GDOT Office of Planning's design traffic group and oversees the development of the design traffic forecasting deliverables that must comply with the GDOT Office of Planning's requirements.*** The TFE may or may not be the Project Manager for the project. It is critical that sufficient resources (time and money) are allocated for the design traffic forecasting activities. Thus, GDOT has identified a standard list of tasks for consultants performing traffic forecasting work in Section 3 of this document.

2.3 State-Funded Projects

In 2015, a new source of transportation funding became available in Georgia. In an effort to expedite the delivery of much-needed transportation infrastructure, GDOT established the "State Process," a new, streamlined process for the development of projects funded with state and/or local funds. Details of the project development process under the State Process can be found in Chapter 10 of GDOT's Plan Development Process (PDP) Manual. In general, the plan development activities under the State Process are more streamlined than the process required for federally-funded projects. Though the State Process includes most of the same basic procedures as the federal process, the State Process allows many activities to begin earlier and run concurrently. ***The traffic data analysis and forecasting procedures required under the State Process are described in Section 3 (Table 2).***

2.4 Rightsizing the Traffic Analysis Activities

It is now recognized that certain types of transportation projects need more detailed traffic forecasting than others to gauge the potential project's impacts on the overall future transportation network in the project area. The forecasting requirements for each project type are described in Section 3 (Table 2).

2.5 Four Required Traffic Forecast Conditions

One of the major challenges in delivering transportation projects is accounting for potential changes in funding levels throughout the life of the project's development. To help reduce the negative impacts of these changing funding levels on project delivery, in 2015, GDOT instituted a new requirement for the traffic analysis and forecasting phase

of its projects. For all proposed federal-aid projects that require a future traffic forecast, there are four traffic conditions that must be analyzed:

1. Base Year (opening year of the transportation facility)
2. Base Year + 2 Years (required by policy to help mitigate the impacts of project funding delays)
3. Design Year
4. Design Year + 2 Years

More details on this requirement can be found in Section 5 of this document.

2.6 Focus on Project Delivery

To provide the maximum benefit to the traveling public, it is GDOT's goal to deliver all of its projects as expeditiously as possible. Thus, traffic engineering practitioners should carry out the required design traffic analysis and forecasting for all GDOT projects as expeditiously as possible, consistent with GDOT project schedules. ***It should be noted that there are points in this process where GDOT approval must be obtained prior to subsequent work proceeding on the project.*** Traffic practitioners should be aware of these key milestones and educate themselves on GDOT's expectations to ensure efficient delivery of projects.

The appendices of this manual include a list of definitions and acronyms, examples of design traffic deliverables, and other relevant information to supplement the requirements outlined in this document,. In the future, other useful information related to design traffic forecasting may be posted on the GDOT Office of Planning's webpage. GDOT will also attempt to distribute information pertaining to design traffic forecasting through professional organizations, such as the Georgia Section of the Institute of Transportation Engineers (ITE).

2.7 Resolution of Traffic-Related Issues

While it is GDOT's intention to expedite project delivery, it is equally committed to ensuring that project activities are carried out in a technically sound and professionally accepted manner. Once the traffic data analysis and forecasting methodology is approved by the GDOT Office of Planning (unless otherwise modified and agreed upon by both parties), a good faith effort will be made by GDOT professionals and consultants (as appropriate) to carry out the agreed-upon activities within the approved project schedule. From time to time, there may be professional differences of opinion among GDOT and consultant team members on matters related to design traffic analysis and forecasting. In those events, a two-step process will be used for resolution.

2.7.1 Level 1 Issue Resolution

Under Level 1, if there is a difference of opinion on the technical requirements for the design traffic forecasting process, the matter will be resolved by the Manager of the GDOT Office of Planning's design traffic group. Should issues persist, either party (GDOT or consultant) may request Level 2 issue resolution.

2.7.2 Level 2 Issue Resolution

Under Level 2 resolution, if the difference of opinion cannot be resolved by the Manager of the GDOT Office of Planning's design traffic group, the resolution will be determined by the Assistant Planning Administrator responsible for the design traffic group. Should issues persist beyond the Level 2 stage, it is understood that GDOT may choose to acquire design traffic forecasting services from another source in order to protect the project schedule and its delivery. If issues remain during the Level 2 resolution stage, all parties have the option of discussing these with the State Planning Administrator.

SECTION 3: OVERVIEW OF DESIGN TRAFFIC FORECASTING PROCESS

This section describes the overall process required by GDOT to complete design traffic data analysis and forecasting for GDOT projects.

3.1 Sequence of Activities

It is the responsibility of the GDOT Project Manager, the Office of Planning's design traffic group, and the consultant project manager to collaborate for the proper scoping, budgeting, and scheduling of design traffic-related tasks and deliverables consistent with the requirements described in this document. The three deliverables requiring GDOT approval include:

1. Date Collection Program (including map and detailed information on the number, type, and duration of traffic data collection)
2. Traffic Data Report (draft and final versions)
3. Traffic Forecasting Report (draft and final versions)

While the particular circumstances surrounding a proposed project may differ, the following general process is used to ensure that the appropriate design traffic data analysis and forecasting process is properly completed. Table 1 describes the sequence of the major elements of the process.

3.2 Required Methodologies, Tools, and Forms

In order for GDOT to expedite the review of design traffic-related documents as efficiently as possible, all TFEs are required to use the required methodologies, tools, and forms described in this manual. Selected examples of deliverables are included in the appendices.

3.3 "Rightsizing" of Traffic Data and Forecasting Activities

All federal-aid projects and certain state-funded projects must conform to the technical requirements described in Table 2 of this section. It should be noted that projects under development and supported with Transportation Investment Act (TIA) funding are not required to comply with the GDOT design traffic forecasting requirements. The technical analysis requirements for different project types vary based on the complexity and nature of the proposed transportation improvement. In general, more robust analysis is required for roadway capacity expansions, while maintenance or operational improvements, have less complex requirements.

For example, because roadway landscape improvements and routine resurfacing of a road will not result in any major change to the design and operation of a roadway facility, there is no need for extensive traffic data analysis and forecasting. Similarly, there are other types of projects where less robust traffic analysis is appropriate. ***For the purposes of this GDOT traffic data analysis and forecasting procedure, the guidance presented in Table 2 should be used to determine which deliverables are required by project type and key elements.*** The GDOT Office of Planning's design traffic group is responsible for making the final determination on the level of traffic data analysis and design traffic forecasting required for individual projects, given the need to expedite project delivery and make the best use of GDOT resources.

In order to assist consultants responsible for design traffic forecasting, an overview of the design traffic forecasting process is included in Figure 1.

Table 1. Major Steps in the Traffic Data Analysis and Design Traffic Forecasting Process

Step No.	Description	Responsible Parties
1	Request to Initiate Design Traffic Forecasting Activities	GDOT Project Manager (PM) is responsible for initiating the design traffic forecasting process via a written request to the GDOT Office of Planning's design traffic group (see Appendix E for standard request form). This form should be accurately and completely filled out and has to be submitted only ONCE for the entire traffic forecasting activities. It is strongly encouraged that the GDOT PM hold a meeting or conference call to discuss design traffic forecasting issues with the consultant team, including the Consultant Project Manager and the TFE as early in the project design phase as possible. The GDOT PM should provide key information about the project and the project team to the GDOT Office of Planning, including the project identification number, location, jurisdiction, and contact information for the Consultant Project Manager and TFE. Upon initiation of the forecasting activities, the GDOT PM should be advised of the GDOT traffic reviewer's contact information.

Table 1 Continued		
Step No.	**Description**	**Responsible Parties**
2	Conduct Data Collection and Analysis, Prepare Traffic Data Report, and Agree Upon the Design Traffic Forecasting Methodology	The TFE will submit a summary of the agreed-upon traffic data parameters for review/approval by the GDOT's design traffic group, including a traffic count map showing the planned locations, types, and durations of counts. ***This information must be submitted to the GDOT Office of Planning's traffic group for approval before any subsequent analysis or forecasting is started.*** After GDOT approves this data and information, the TFE will prepare the existing condition traffic diagrams (following the GDOT Plan Presentation and Electronic Data guidelines) and a description of the traffic forecasting methodology and parameters. The TFE should also document the existing conditions, including the results of the actual traffic counts and the site visit, including descriptions of other data and information that are pertinent to the traffic forecast. The TFE will compiles all of this information into a draft Traffic Data Report, which is submitted to the GDOT Office of Planning's design traffic group for approval. If GDOT provides any comments or requested revisions, the TFE will address them and submit the final Traffic Data Report. In order to expedite project delivery, the TFE and the GDOT traffic reviewer are expected to comply with the established project schedule. ***It is expected that all GDOT comments on the proposed data parameters and draft Traffic Data Report should be compiled from all internal GDOT parties and transmitted in a single submission to the TFE for appropriate action.*** The TFE should submit the final document to GDOT for approval within ten (10) working days of receipt of the GDOT comments. ***No subsequent design traffic forecasting activities should be undertaken by the TFE prior to GDOT approval of the final Traffic Data Report.***
3	Perform Traffic Forecasting Work and Prepare the Traffic Forecasting Report, including all required deliverables	Once the final Traffic Data Report, including the forecasting methodology, are approved by GDOT, the TFE should proceed with the traffic forecasting activities. Following the agreed-upon schedule for the forecasting tasks, the TFE will complete the forecasting analysis and prepare and submit a draft Traffic Forecasting Report, including the future condition traffic diagrams, to the GDOT Office of Planning's design traffic group for approval. If GDOT provides any comments or requested revisions, the TFE will address them and submit the final Traffic Forecasting Report. ***It is expected that all GDOT comments on the draft document will be compiled and transmitted to the TFE in a single submission for appropriate handling and revisions.*** Upon approval, the GDOT Office of Planning's design traffic group will distribute the TFE to the GDOT and consultant project teams

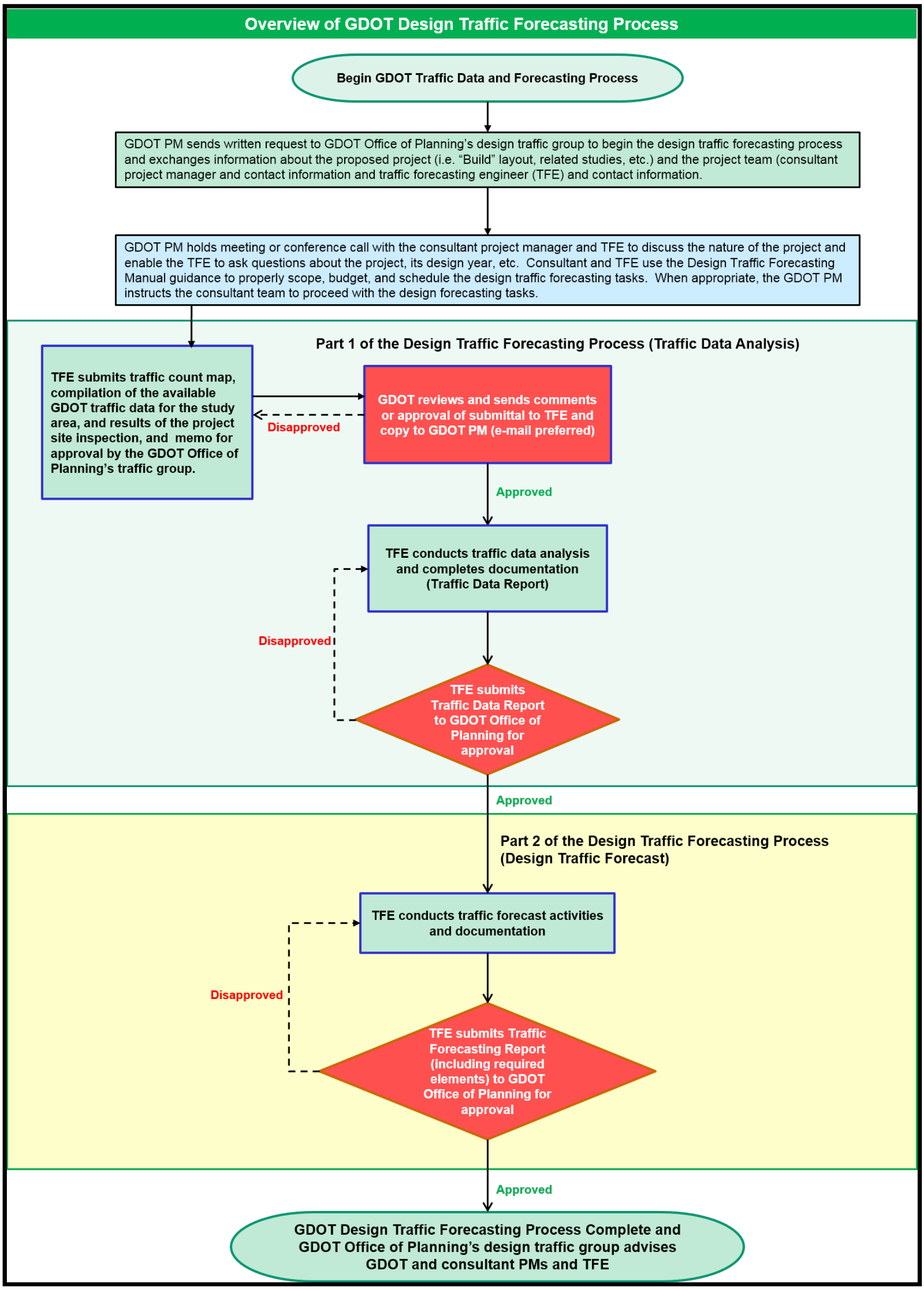


Figure 1. Overview of GDOT Design Traffic Forecasting Process

Table 2. Traffic Data and Forecasting Analysis Requirements by Project Type[1]

Extent of Analysis	Project Type	Deliverables
Minimal Analysis	Roadway landscaping and routine roadway resurfacing	Current and future forecast traffic volumes, including AADT and DHV
Minor Analysis	Roadway reconstruction or rehabilitation ("3R") projects; bridge rehabilitation; reconstruction of new bicycle/ pedestrian facility or trail; new traffic signal(s); signal modification(s); access management improvement at a single location, etc.	• Raw (unadjusted) traffic counts • Link volume diagrams for Existing AADT and DHV • Existing Conditions Report (draft and final) • Traffic Data Report (draft and final) • Traffic Forecasting Methodology and Parameters • Link volume diagrams for Future AADT and DHV
Full Analysis	Traditional widening of a road segment or corridor; new or reconfigured interchange; intersection improvement, including innovative or non-traditional intersection; bridge widening; corridor-based traffic control/ITS improvements; corridor-level access management improvements; major roadway capacity project involving a combination of general use and managed lanes, etc.	• Raw (unadjusted) traffic counts; • Raw (unadjusted) AM and PM peak period turning movement counts • Existing AADT and DHV traffic diagrams in MicroStation format • Existing Conditions Report (draft and final) • Traffic Forecasting Methodology and Parameters • Future AADT and DHV traffic diagrams in MicroStation format

[1] GDOT projects under development that are funded with Transportation Investment Act (TIA) resources are not required to comply with the design traffic forecasting requirements shown in this table.

3.4 Consultant Tasks for Performing Traffic Data and Forecasting Work

In order to assist consultants responsible for design traffic forecasting work, the following tasks related to this traffic data and forecasting should include, but are not limited to:

1. Discuss traffic data and forecasting needs for the project with GDOT PM and GDOT Office of Planning's design traffic group
2. Perform and document site visit
3. Analyze and determine count locations including volume and classification counts
4. Analyze need for other types of counts (speed, origin-destination, etc.)
5. Analyze existing GDOT traffic data in the area (GeoCounts website, automated traffic count locations (ATRs), etc.)
6. Analyze and determine AM and PM peak periods and intersection turning movement count locations
7. Generate traffic count location map
8. Submit traffic count location map for GDOT review
9. Address GDOT review comments (as needed)
10. Submit and coordinate approved traffic count location map to traffic data collection vendor
11. Analyze results of collected traffic counts from vendor
12. Generate Existing Year traffic flow diagram (AADT and DHV)
13. Generate Traffic Forecasting Methodology Memo
14. Submit Traffic Data Report (Existing Year traffic flow diagrams and Traffic Forecasting Methodology Memo document) to GDOT for review
15. Address GDOT review comments (as needed)
16. Generate Base Year traffic flow diagrams (AADT and DHV) for Build and No Build Conditions
17. Generate Design Year traffic flow diagrams (AADT and DHV) for Build and No Build Conditions

18. Generate Base Year + 2 traffic flow diagrams (AADT and DHV) for Build and No Build Conditions
19. Generate Design Year + 2 traffic flow diagrams (AADT and DHV) for Build and No Build Conditions
20. Submit Existing Year, Base Year (Build and No Build Condition), Design Year (Build and No Build Condition), Base Year + 2 (Build and No Build Condition), Design Year + 2 (Build and No Build Condition) traffic flow diagrams and Traffic Forecasting Report for GDOT review and approval
21. Address GDOT review comments (as needed)
22. Submit all traffic flow diagrams in PDF and Microstation formats

SECTION 4: TRAFFIC DATA ANALYSIS FOR DESIGN TRAFFIC FORECASTS

This section describes the required traffic data collection, analysis, and documentation necessary to initiate a design traffic forecasting effort and successfully complete the required Traffic Data Report. ***These activities comprise the first part of the design traffic forecasting effort***.

4.1 Initiation of Design Traffic Forecast

Once the request for a design traffic forecast is requested by a GDOT PM (see Appendix E for standard request form), the TFE begins the process of coordinating this work with the GDOT Office of Planning's design traffic group. The first step in the process is a discussion among the GDOT PM, the GDOT traffic reviewer (Office of Planning) and the TFE for the consultant team to confirm the parameters of this phase of the project development. These parameters include, but are not limited to:

- Agreement on the proposed locations for traffic data collection
- Agreement on the types of traffic data to be collected (volume count, classification count, intersection turning movement count (TMC), etc.)
- Duration of the traffic data to be collected (48-hour volume or classification count, six-hour TMC, etc)
- Schedule showing dates and times for traffic data collection (month/day/year) to ensure that data are collected during routine or "normal" periods vs. special event days, summer or holiday vacations, etc.

As an initial step in the design traffic data collection and analysis activities, the TFE is required to submit a traffic count location map with the key data described above to the GDOT Office of Planning's design traffic group for review and approval, prior to the collection of traffic data and subsequent data and forecasting tasks.

4.2 Traffic Count Rules

Traffic count data collected for traffic forecasting purposes must be representative of "normal conditions" in the project area. To ensure that the traffic data meet this requirement, data collection during the following periods are not acceptable for design traffic forecasts unless agreed-upon with the GDOT Office of Planning's design traffic group prior to obtaining the counts:

- Sundays, Mondays, Fridays, and Saturdays

- When public schools are not in session (generally, late May through early August, depending on the study area – the exact timeframe should be confirmed prior to collecting traffic data)
- During holiday periods when travel patterns are not routine (from a week before Thanksgiving to a week after New Year)
- Days when special events at major traffic generators may disrupt routine traffic patterns
- During special events that generate traffic that is not typical of everyday operations
- During or immediately following significant inclement weather events (blizzards, tropical storms, etc.)
- During the week following a time change due to the start or end of Daylight Saving Time
- During construction in or near the project area
- During traffic incidents (i.e. crashes) that disrupt normal traffic patterns

In some areas of the state, traffic conditions may not change significantly throughout the year. If there are no major changes in travel patterns or land use patterns in the project area, this should be documented by the TFE. In general, traffic count data is considered outdated after approximately five years following the date of collection. Exceptions to this rule, however, may be considered depending on local conditions and other factors. To help manage this aspect of traffic forecasting, GDOT is in the process of developing a project management tool that will allow PMs to track the "life" of the traffic data, thereby preventing major project delays. When completed, this tool will be provided on the GDOT Office of Planning's webpage.

The GDOT Office of Planning's design traffic group observes the following additional traffic count "rules" for design traffic forecasting activities. The TFE should comply with these guidelines in the collection of traffic counts.

- Minimum 48 hour bi-directional counts are required on all road segments within the project description area with an expected traffic volume of 50 vehicles per day (VPD) or more.
- The traffic counts in the project must include the intersections or interchanges at the ends of the project (as stated in the project description). For example, for a project called "I-16 @ I-95 to I-516", the entire I-16 @ I-95 interchange and the whole I-16 @ I-516 interchange must be included in the traffic count collection.
- Additional counts outside of the project area may be required for logical termini or other reasons on an as-needed basis. Additional count requirements will be listed on the Traffic Projections Review Request Form submitted by the GDOT PM or other GDOT personnel to the GDOT Office of Planning's design traffic group (see Appendix E for standard request form).

- Gravel roads within the project area that have an expected volume of 50 vehicles per day (VPD) or more should be counted.
- All legs of the intersection in a project area should have AM and PM turning movement counts during the three-hour AM peak period and three-hour PM peak period.
- The TFE should choose the turning movement count hours by checking the hours of highest AM and PM traffic volume for the most recent actual counts for GDOT traffic counters in the project area as shown on the GeoCounts website. Figure 2 shows a screenshot of the GeoCounts website.
- After collecting all of the traffic counts, the TFE should choose the AM and PM peak hours based primarily on the hours with the highest mainline counts. The Design Hour Volumes (DHV) traffic should be based on the counts at the selected AM peak hour and the selected PM peak hour.
- Vehicle classification counts should be done:
  - On mainline at the beginning and at the end of each project
  - On all state routes in the project area
  - On any road with an anticipated high volume of truck (i.e. near ports, truck stops, distribution centers, rest stops, etc.)
  - On all ramps in the project area
- If interstates or other limited access facilities are located within the project area, traffic counts along these facilities should be taken if possible. Since tube counters are not reliable for these situations, video counts can be used. If it is not possible to conduct video counts, use the data from the nearest GDOT count location.
- Traffic counts for one way in/one way out subdivisions may be estimated using the most recent version of the Institute of Traffic Engineers (ITE) *Trip Generation Manual*. All estimates must be documented in the Traffic Data Report. However, it is preferable to do actual counts whenever possible to expedite GDOT's approval of the traffic data.
- Traffic counts should be taken for commercial driveways if the counts contribute to the understanding and documentation of the project area traffic movements.
- Counts from multiple years should not be used to develop existing traffic. All counts should be done in the same year, preferably during the same week.
- Counts for existing traffic should not be more than five years old. Although it is preferable to have existing traffic counts for the current year, existing traffic from previous work can be used if the supporting traffic counts are within four years of the current year and the most recent coverage counts of the project area do not show more than a 10% deviation from the previous traffic work (not including year--to-year growth).

- If any atypical situations are present in the project area, the GDOT Office of Planning's design traffic group should be consulted for guidance on the number, type, extent, and location of traffic data to be collected.

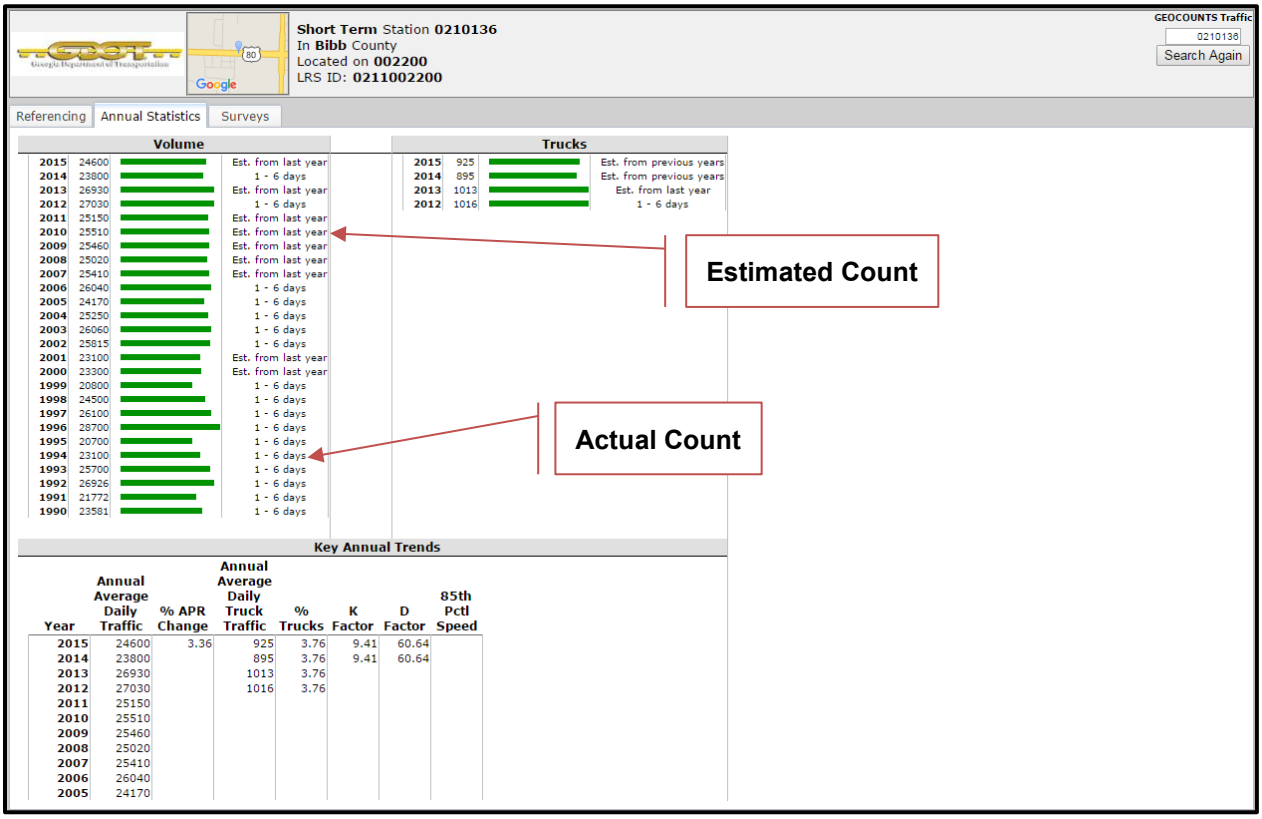


Figure 2. Sample Screenshot from the GeoCounts Website

4.3 Site Visit and Data Collection

At the outset of the traffic data collection activities, it is strongly recommended that the TFE: (1) research and obtain already available GDOT data for the project area; (2) visit the project site to gather current traffic information not readily available from GDOT and other sources; and (3) familiarize themselves with the existing field conditions prior to submitting the traffic count location map to GDOT for approval. ***Following these guidelines will reduce the potential for having to re-collect the traffic counts or request additional counts at a later date, thereby minimizing the potential for delay or added expense to the project.***

During the traffic data analysis phase of the forecasting process, the TFE is responsible for developing a draft and final Traffic Data Report that includes all traffic counts conducted for the project; required AADT and DHV traffic flow diagrams for the existing conditions; a summary of existing traffic conditions; and a memo describing the proposed traffic forecasting methodology and parameters. The following data and information are

considered important to the traffic data analysis process and should be collected during the site visit. The TFE should use professional judgment to consider including other data that will contribute to a greater understanding existing traffic conditions and forecast conditions at the project site. Data collected during the site visit should include, but may not be limited to:

- Road Geometrics
  - Curves and grades (if affecting capacity or traffic operations)
  - Number of lanes, lane usage, and presence and type of medians
  - Widths of lanes, median, and shoulders
- Traffic Control
  - Signalized intersection location
  - Traffic signal timing and phasing
  - Traffic signs (particularly, regulatory signs and posted speed limits)
  - Regulatory pavement markings
  - Marked and unmarked crosswalk locations
- Multimodal Conditions, and Safety and Mobility Concerns
  - Transit stop and/or station locations and amenities, signs and other structures, transit route numbers, frequency of service (i.e. hourly, etc.), and types of transit vehicles in service (i.e. transit coaches; trolleys, paratransit vehicles, etc.)
  - Presence and condition of sidewalks, bicycle lanes, and multi-use paths
  - Indications of unsafe bicycle and pedestrian conditions (i.e. lack of paths and/or crosswalks, etc.)
  - Presence and needs of vulnerable populations (i.e. children, seniors, visually and hearing impaired people, physically disabled persons, zero- or one-vehicle households, pedestrians, and bicyclists)
  - Indications of traffic congestion (e.g., queues at intersections)
  - Differences in grades, sight distance issues, etc.
  - Conditions on side streets with an annual average daily traffic (AADT) greater than 50 vehicles per day
- Historical Traffic Count Data
  - Historical daily volume counts for the most recent fifteen years are available from the GeoCounts website. The GDOT Office of Transportation Data may also be contacted for this information.

- Traffic Safety Data
  - To obtain this data, please refer to GDOT's Crash Data website. Traffic data related to corridor crashes and intersection crashes should be documented separately, as `appropriate, given the nature of the proposed project.
- Vehicle Speed and Occupancy Data
  - Speed counts and seven-day vehicle classification counts (if deemed necessary by project needs);
- Land Use and Development Context and Access
  - Location, width, and length of driveways for major vehicle traffic generators; truck trip generators, etc.
  - Consideration for collecing data on truck trips at driveways should be the same as would be collected for side streets
  - Adjacent land uses, densities, and intensities of uses (i.e. multi-story buildings, special traffic generators, such as athletic fields, schools, downtown areas, regional shopping malls or other retail areas, etc.), and estimated occupancy
  - Evidence of newly developed or redeveloping sites or areas, including names of the development, the development company's name, and contact person and phone number (from signs on the property)
  - Evidence of new intersecting roadways or driveways under construction
  - Locations of truck turnarounds
- Other Data
  - Pavement conditions
  - Presence and type of on-street parking and parking regulations
  - Presence of street lighting
  - Route number/local name/governmental jurisdiction

Additional data that may be recorded include sight distances, vertical and lateral clearances, any safety hazards, utility information (such as utility poles, storm drains, and valve cover locations), and the location and widths of right-of-way. The TFE should refer to GDOT's website or contact local government agencies to determine if there are hazardous or high-crash locations within the study area. Local law enforcement, planning, or transportation agencies may collect this type of data for non-state roadways in many communities.

Available GDOT data sources should be reviewed prior to a site visit. This includes GDOT Functional Classification maps, traffic data available of the GDOT web site, and the GDOT Transportation Data Viewer. The GDOT Transportation Data Viewer contains route identification and classification, road geometrics, traffic, and other information. The

TFE should contact the Manager of the GDOT Office of Planning's design traffic group for guidance if site conditions differ from available GDOT data.

Bicycle and pedestrian counts need not be requested unless the project is located where there are observed high levels of pedestrians and bicycling activity, such as at or near a university campus, event center, central business district, or low-income residential area where these modes may be used more frequently. In MPO areas, there may be available bicycle and pedestrian count data that can be incorporated into the traffic analysis.

4.4 Traffic Adjustment Factors

Machine traffic counts should be adjusted using a seasonal factor (SF) and axle correction factor (ACF) to estimate existing AADT volumes. Local factors should be calculated using data from the following:

- GDOT Automatic Traffic Recorders (ATR) located near the project; and
- "Traffic Factors" obtained from the GDOT Traffic Data website.

Traffic adjustment factors developed for the project and applied to counts collected for the project should be documented in the Traffic Data Report, which is submitted to the GDOT Office of Planning for approval.

4.5 Average Annual Daily Traffic (AADT)

Traffic volume data are commonly reported as average annual daily traffic (AADT) and are typically used for highway planning and the design of pavement structures. The AADT volume is defined as the average of the measured 24-hour traffic volumes at a given location over a full 365-day year, or the total number of vehicles passing the site in a year divided by 365. An average daily traffic (ADT) volume is defined as the average of 24-hour traffic volumes for a given location for some period of time less than a year and as little as two days. While AADT is measured over a full year, an ADT may be measured for six months, a season, a month, a week, or as little as two days.

Where not measured over a full year, the AADT for a given location may be estimated by applying the seasonal factor (SF) and axle correction factor (ACF) to the ADT as follows:

$$AADT = ADT * SF * ACF$$

AADT volumes are expressed in units of vehicles per day (vpd) of total vehicles for all lanes in both directions. The GDOT Office of Transportation Data maintains the GeoCounts website with traffic count data collected from permanent and portable traffic collection devices located throughout the state, representing most segments of Georgia's State Highway System. Annual data are available beginning with the year 1999.

4.6 Design Hourly Volumes (DHV)

While daily traffic volumes are very useful in the planning phase of projects, DHVs are needed for capacity analyses and design decisions, such as to determine the number of traffic lanes for a roadway. Volumes may vary significantly during the course of a 24-hour day with periods of maximum volume occurring during the morning or afternoon peak hours. For roadway segments, the single hour of the day that has the highest hourly volume is called the "Design Hour." Capacity and other traffic analyses typically focus on the design hour of traffic volumes for roadway segments. For intersection analysis, the design hour is evaluated for the AM and PM peak hours because it represents the most critical period for operations and has the highest capacity requirement. The following formula expresses the relationship between the design hour volume (DHV) and the annual average daily traffic (AADT) volume:

$$\boldsymbol{DHV = AADT\ x\ K}$$

where K represents for "K-Factor," which is defined as the proportion of traffic occurring during the 30th highest hour of the year, usually obtained from permanent automatic traffic recording sites. The K-Factor can be estimated from a traffic count as the ratio of the peak hour volume during the day to the total daily volume. For intersection analyses, the terms "AM K-factor" and "PM K-factor" may be used to compute the AM peak hour and PM peak hour volumes.

The directional design hour volume (DDHV) is the traffic volume for the peak hour in the peak direction of flow. Directional distribution factors (D-Factors) should be established from existing traffic counts conducted at the project site. If existing counts are not available, counts can estimated from ATR locations along the route or along nearby routes with the same functional classification. If there are no nearby ATRs to use, it may be assumed that 60% of the traffic is traveling in the peak direction.

Using traffic counts collected along the project location, the peak hour (K-Factor) and directional distribution factors (D-Factors) can be calculated and compared to any ATR locations maintained by GDOT along the route and the provided online via the GeoCounts website. If there are no ATR locations along the route, ATR locations along nearby routes with the same functional class can be used. Appropriate K and D factors must be discussed in the Traffic Data Report, specifically in the traffic forecasting methodology memo, and approved by the GDOT Office of Planning's traffic group. The approved K and D factors are then applied to the AADT volume to calculate the design hour volumes. In some cases, the PM movement is often the return movement from the AM movement. The TFE should review the existing hourly traffic counts to determine if this is the correct assumption for their forecast. If it is not, separate AM and PM DHVs should be calculated.

4.7 Intersection Turning Movement Data

The existing turning movement data for the AM and PM peak periods (three hours each) at all intersections (for all legs) in the project area must be collected through field counts. ***If, in the opinion of the TFE, there are legs or intersections that do not need to be counted due to field conditions, these should be identified in the traffic count location map submitted to the Office of Planning at the beginning of the traffic data and forecasting process, along with the justification for omitting the counts.*** The GDOT Office of Planning will be responsible for making the final decision on the location and type of traffic counts to be collected. The TFE should document all GDOT decisions related to the location and types of traffic counts for the purpose of monitoring project delivery.

4.8 Intersection Turning Movements for AADT Volumes

AADT turning movement volumes must be calculated for each intersection within the project limits using project area roadway AADTs and estimated intersection turning movement patterns. These estimated turning movement percentages should be based on existing turning movement counts and roadway counts collected along the project area roadways. The AADT turning movement volumes at intersections are frequently used to conduct preliminary signal warrant analysis for future conditions.

4.9 Intersection Turning Movements for AM and PM Peak Hour Volumes

At major intersections and at driveways leading to major activity centers, the “Design Hour” is typically identified for the morning or “AM peak hour” and “afternoon/evening” or “PM peak hour,” since traffic patterns (peak volume demand for each particular turning volume) change between the two time periods. The peak hour turning volumes are important for estimating the intersection capacity and determining the number of lanes needed, the storage length for exclusive turning lanes required for each approach, and the most appropriate traffic controls for the intersection (including the signal timing and phasing plans). It is important to look at both AM and PM peak hour volumes because one turning movement may be higher in the AM peak hour, while a different movement at the same intersection may be higher in the PM peak hour. Each of these movements must be designed for their particular highest demand. The DHV turning movement volumes at intersections should be calculated based on the AADT volumes, K-Factors, D-Factors, and estimated intersection turning movement patterns.

4.10 Traffic Flow Diagram Documentation Standards

The following standards and conventions should be used throughout the traffic data analysis and documentation activities in order to expedite approval of the documents by GDOT.

- Annual Average Daily Traffic (AADT) volumes should be rounded to the nearest 25.
- Design Hour Volumes (DHVs) should be rounded to the nearest 5.
- Truck percentages should be rounded to the nearest 0.5%. Both Single Unit (SU) trucks (FHWA Classes 4 through 7) and Multi-Unit or Combination (Comb) trucks (FHWA Classes 8 through 15) should be provided for AADT and DHV traffic flow diagrams.
- Show minimal movement volumes that are less than 25 vehicles per day as MM (instead of zero – twenty four (0 - 24)) for AADT traffic flow diagrams.
- Show minimal movement volumes that are less than 5 vehicles per hour as MM (instead of zero –four (0 - 4)) for DHV traffic flow diagrams.
- AADT traffic flow diagrams should have the volumes represented as "(Design Year)/Base Year" on each sheet. Do not separate design year and base year sheets.
- DHV traffic flow diagrams should have the volumes represented as "(PM)/AM" on each sheet. Do not separate AM and PM sheets.
- Use GDOT standard file format and cell libraries in Microstation based on the latest versions.
- Include company name, project ID, project PI #, County, and a directional arrow on all traffic sheets, and initial and date all traffic sheet updates and quality control checks in the appropriate area of the traffic sheets..

All TFEs and GDOT and consultant PMs should monitor GDOT webpages with traffic-related resources to verify the latest standards for traffic-related documents.

4.11 Traffic Data Report Requirements

At the conclusion of the traffic data and analysis activities (and prior to the design traffic forecasting tasks), the draft Traffic Data Report must be submitted to the GDOT Office of Planning's design traffic group for review and approval. The report should include: (1) the project description; (2) discussion of the existing conditions at the project site, including results from the field visit, data available from GDOT, and new traffic count data collected for the project; (3) the identification and discussion of related projects (other projects underway, planned, or programmed in the study area); (4) discussion of the K

and D factors; (5) discussion of truck volumes and percentages; (6) development and assumptions used for the traffic growth rate; (7) discussion of the traffic growth rate for the No Build and Build conditions, with references in the appendices; and (8) a memo describing the proposed traffic forecasting methodology and parameters. The following information should be provided in the draft Traffic Data Report:

- Title Section
- Project Description
- P. I. #
- County
- Current Date
- Name and description of project, project purpose, related projects, project area, field trip, and count map discussion
- Assumptions discussion, including development, new roads, traffic diversions, etc.
- K and D factor discussion and summary chart with mainline K and D for No Build and Build cases
- Truck percentage discussion stating mainline truck percentages and any truck related facilities in the project area
- Growth rate development discussion for No Build and Build cases with a chart of the mainline No Build and Build existing to base year and base year to design year growth rates
- Discussion of development trends in the project area
- Latest Census data
- Travel demand model data (MPO or Statewide travel demand model, as applicable)
- Related studies, analysis, or other information
- Traffic Sheets (Existing condition traffic flow diagrams, including AADT and DHVs)

The draft Traffic Data Report should include an Appendix that includes the following items:

- Traffic Projections Review/Request Form
- Traffic Count Map
- Field Trip Report
- Raw Counts
- K and D calculation chart for all counts in required format
- Truck Percentage calculation chart in required format

- Growth Rate Analysis References
- GDOT Historical Traffic Counts and Consultant's Actual Counts Growth Rate Calculations
- Project Area Development Findings
- Census Population Data
- Model data (if applicable)
- Related studies or additional information used

Following review of the draft Traffic Data Report, the GDOT Office of Planning's traffic group will provide a set of consolidated comments to the TFE. The TFE is responsible for addressing the comments and submitting the final Traffic Data Report to GDOT within 10 working days of receipt of the comments. The TFE should consult Appendix E for examples of required deliverables.

In order to assist consultants responsible for design traffic forecasting work, an overview of the traffic data analysis process is presented in Figure 3.

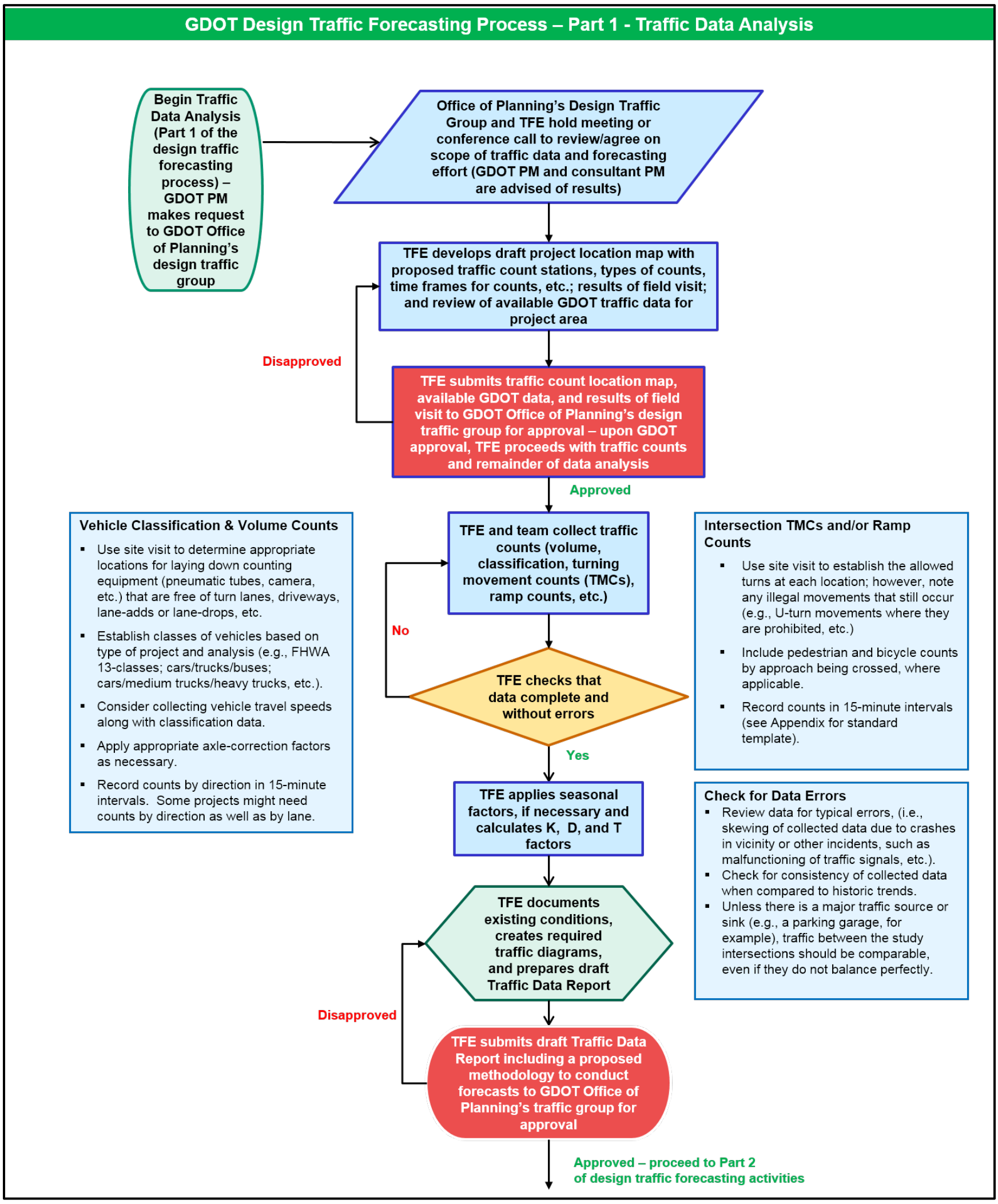


Figure 3. GDOT Design Traffic Forecasting Process – Part 1 - Traffic Data Analysis

SECTION 5: DESIGN TRAFFIC FORECASTING PROCESS, STANDARDS, AND DOCUMENTATION

This section provides detailed guidance for traffic engineering practitioners involved in developing design traffic forecasts for GDOT projects supported with federal and/or state funds. Included in this section are narrative and graphical descriptions of the work flow of technical activities that are necessary to meet GDOT's traffic forecasting requirements. These activities represent the second element of the design traffic data analysis and forecasting process.

5.1 Four Forecast Conditions

For all GDOT projects that require traffic forecasts, the TFE must develop forecasts for four (4) specific conditions: (1) the Base Year; (2) the Base Year + 2 years; (3) the Design Year; and (4) the Design Year + 2 years. The "plus 2" conditions are necessary to help address potential changes in funding levels and changes in project delivery scheduling that routinely occur and affect GDOT projects. The four forecast conditions are described below:

- The Base Year forecast represents the conditions present at the year the project is anticipated to be open for traffic. For example, if a project is scheduled for a let date in 2020 and it is estimated that the project will take two years to construct, then the forecast will reflect traffic volumes expected at the Base Year of 2022.
- The Base Year + 2 forecast should reflect the conditions expected two years following the Base Year date. The TFE should not confuse this year with the programmed fiscal year for construction or the project let (bid award) date.
- The Design Year conditions reflect the anticipated future horizon year for the project. For most GDOT projects, the design year will correspond to the Base Year plus 20 years. For example, the TFE would develop 2042 design year traffic volumes for a project with a Base Year of 2022. For some projects, the Design Year may be shorter than 20 years. Projects with these shorter design years could include minor safety and intersection improvement projects or interim projects that may be programmed to address a short-term operational problem.
- The Design Year + 2 conditions are those expected two years after the Design Year of the project.

Due to the need to balance the project schedules of the hundreds of projects led by GDOT and the availability of federal and state project funding, it is extremely important that the TFE confirm the appropriate base and design forecast years with the GDOT Project Manager at the beginning of the design traffic forecasting process.

5.2 Future Forecast Traffic Volumes

The Base Year and Design Year average annual daily traffic volumes (AADT) and design hourly volumes (DHV) for the project area roadways should be calculated from the approved existing condition traffic volumes adjusted to reflect the estimated traffic growth rate.

5.3 Development of Traffic Growth Rates

The required GDOT traffic forecasting methodology relies on two important calculations:

- The existing traffic growth rate based on the analysis of long-term (historical) trends in traffic volumes *based on actual traffic counts* (not just travel demand model data or output); and
- An estimated future annual traffic growth rate based on expected population and employment growth due to new development or redevelopment *based on documented, credible information sources.*

The TFE should thoroughly document all assumptions on historical trends and estimates of future population and employment growth due to new development and redevelopment. All sources of data and information supporting the proposed traffic growth rates should be clearly identified.

5.4 Use of Urban Area Models or GDOT's Statewide Model in Forecasting

A well-validated transportation model, or travel demand model, is a frequently used and effective tool in certain aspects of design traffic forecasting. Such models include MPO travel demand models and GDOT's Statewide Travel Demand Model (GSTDM) for areas outside MPO boundaries. ***A model, however, does not replace a full design traffic forecasting effort.*** Before a travel demand model can be used for design traffic forecasting, additional details on the project area may need to be obtained, and additional traffic analysis zones and roadway links may need to be created in the model to more closely reflect project area conditions. The model should also be refined to incorporate committed future developments in the project area.

The NCHRP 765 Report entitled *"Analytical Traffic Forecasting Approaches for Project-Level Planning and Design,"* provides guidelines and best practices to produce travel forecasts for highway project-level analyses. The TFE may use this guidance to support forecasting activities. ***Projected volumes directly from the travel demand model should not be used as the detailed design traffic forecasts for GDOT projects.***

For a proposed transportation improvement project on a major highway within an urbanized area, the MPO travel demand model can be used to help estimate growth rates for the future forecast conditions. Roadway improvement projects in rural areas (outside

MPO areas) will utilize the GSTDM to help estimate growth rates for the future forecast conditions. The estimated growth rates from the travel demand models should be compared to historical traffic count trends from GDOT. Any significant discrepancy between growth rates estimated from model volumes and historical growth trends should be documented and properly accounted for in the future forecasts.

The database of available historical traffic counts from GDOT counting stations can be accessed from GDOT's GeoCounts website. Data from several counting stations in the vicinity of the project should be obtained in order to calculate the historical traffic growth trends in the project area. To represent growth patterns for a particular project roadway, growth trends at counting stations along that same roadway or along roadways of similar functional classification and characteristics can be calculated and averaged. ***The GDOT Office of Planning will not approve traffic growth rates that are derived from average growth trends calculated along roadways with different roadway classifications.***

If possible, the TFE should use historical counts for the past 15 years from the GeoCounts website and document all assumptions as part of the traffic forecasting process. This data should be incorporated into an electronic spreadsheet, and any apparent erroneous counts or clear outliers should be omitted. If the counting station is a portable (or short-term) station, the TFE should use count data only for the years for which an actual count was performed, and not for the years for which counts were estimated. The estimated data are designated "*estimated from previous years*" and can be identified on the GDOT GeoCounts website. In addition to the collecting historical count data from this website, the TFE should also collect counts for the existing year.

Any significant difficulties in accessing appropriate historical traffic count data should be documented by the TFE and resolved with the GDOT Office of Planning's design traffic group. The annual traffic growth rate based on historical trend analysis is part of the traffic forecasting process. In addition to historical trends, the actual growth rate to be used in the traffic forecasting process should give due consideration to predicted population and employment growth rates that can be documented from credible sources, such as local comprehensive plans, related MPO or regional plans, and comparisons to MPO travel demand model outputs, if available. Future population and employment growth data should be obtained from the appropriate MPO or from the Governor's Office of Planning and Budget (OPB) for non-MPO areas. The estimated traffic growth rate must be documented in the Existing Conditions section of the Traffic Data Report and in the Traffic Forecasting Report submitted to the GDOT Office of Planning for review and approval at the conclusion of the design traffic forecasting effort.

For cases where the historical growth rates and future growth rates predicted by population or employment growth or the travel demand model are minimal or negative, a minimum growth rate of 0.5% should be utilized in the traffic forecasting process and should be clearly stated in the Existing Conditions and Traffic Forecasting Parameters Report submitted to GDOT for approval.

5.5 Accounting for Generated Traffic in Traffic Growth Rates

Generated traffic is a result of diverted traffic as well as induced vehicle travel. When an existing route is paralleled by a much more attractive new route or improved facility (on the basis of ease of travel), the total traffic on the two facilities will be greater than that on the older facility prior to the opening of the new facility. This additional traffic that results from diversion and normal growth is termed "generated traffic" and should be considered when the estimated future growth rate is being determined. This generated traffic is made up of the classes of trips listed below:

- Trips that would not have been made at all, or would be made less frequently, if the proposed transportation improvement were not available.
- Trips that would have been made to other destinations or from other origins. For example, the paths of shopping or business trips might be changed because of a shift in relative ease of travel.
- Trips diverted from other modes of transportation. This mostly applies to new interstate routes.
- Trips resulting from new developments along the road that are developed simultaneously with the construction of the new road.

Generated traffic is typically greatest for new interstate routes and other freeways. Some generated traffic can be expected for widening projects. Typically, generated traffic is more likely to occur in urban areas. In general, generated traffic should be accounted for through the use of sound engineering judgment on the part of the TFE. All assumptions related to generated traffic should be documented. The estimated future growth rate (the normal growth rate without adjustments) may be multiplied by a range of 1.00 (no adjustment) to approximately 1.60 (for new interstates) to account for generated traffic depending on the professional engineering judgment of the TFE in consultation with the GDOT Office of Planning's design traffic group. The adjustment for generated traffic should also be considered when determining whether the growth rates used to develop the No Build and Build traffic volumes will be identical or different.

5.6 No Build and Build Scenarios

The definition of roadway geometrics for traffic volume forecasting is largely based on National Environmental Policy Act (NEPA) project definitions. ***Since traffic forecasts are used throughout the project development process, it is important that the definition of the No Build and Build scenarios and Base Year and Design Year remain consistent.*** This section describes the definitions of each and how to determine the appropriate roadway geometries for the proposed project under each scenario.

Table 3 shows the definition of the No Build and Build scenarios for projects within MPO areas and outside MPO areas. It should be noted that the design traffic forecasts for the

No Build and Build scenarios may have different traffic growth rates. This could occur in the following situations:

- When the proposed project involves a non-traditional design that would provide significantly better levels of service to vehicles vs. the current situation;
- The proposed transportation project involves a roadway facility adjacent to a major traffic generator, such as a regional mall or stadium;
- Other situations identified by the GDOT Office of Planning's traffic group in consultation with GDOT and consultant PMs.

Table 3. Roadway Geometries for No Build and Build Scenario Definitions

Location	No Build Scenario Definition	Build Scenario Definition
Within an MPO Area	Same geometry as in the MPO Long-Range Transportation Plan and approved model; should generally be the network plus any approved projects within the State Transportation Improvement Program (STIP) timeframe.	Same geometry as in the MPO Long-Range Transportation Plan and approved model; should be consistent with the model network for the given analysis year.
Outside an MPO Area	Consult Statewide Transportation Plan (SWTP) to determine adjacent projects to be included.	Consult Statewide Transportation Plan (SWTP) to determine adjacent projects to be included.

5.7 Base, Interim, and Design Years

The Base Year or ("open to traffic" year) is generally driven by the GDOT project delivery schedules and/or project funding. Multiple sources are available to determine the appropriate analysis to use for the base year. The primary sources include:

- State Transportation Improvement Program (STIP)
- GDOT's Transportation Project Search Website
- An MPO's Long-Range Transportation Plan (for projects in MPO areas)

The project's Base Year or the "open to traffic year" should always be confirmed with the GDOT Project Manager prior to proceeding with the traffic forecasting activities. Unless otherwise determined by GDOT and FHWA, the Design Year should be the Base Year plus twenty years. If the project is to be constructed in phases or if there are adjacent projects that are anticipated to have a major impact on the project, then it may be necessary to complete an interim analysis for a period covering less than 20 years. ***The need for an interim analysis should be addressed and approved by the GDOT design traffic group, in consultation with the GDOT PM and FHWA, at the***

outset of the traffic data analysis and forecasting process. The need for an interim analysis year and consultation with FHWA will be determined on a case-by-case basis by the GDOT design traffic group, the GDOT PM, and the TFE. It should be noted that the networks do not necessarily have to remain the same between analysis years. For each analysis year, the definitions shown in Table 3 should be used to determine the appropriate No Build and Build conditions.

5.8 Traffic Forecast Calculations for Special Project Types

In recent years, GDOT has been implementing innovative designs in transportation infrastructure across the state. Some examples of these innovative or non-traditional designs include roundabouts, diverging diamond interchanges, continuous flow intersections, quadrant roadway intersections, and restricted crossing U-turns, among others. These special project types necessitate additional considerations with respect to design traffic forecasting. Depending on the nature of certain types of projects, additional, specific procedures must be followed by the TFE to develop the design traffic forecasts for the project. Guidance on developing traffic forecasts for some of the non-traditional designs are described in this section.

5.8.1 Unconventional Roadway and Intersection Designs

Several unconventional designs are gaining in popularity and widespread use for their potential added benefit to reduce vehicular congestion by enabling efficient traffic signal operations and traffic flow, while providing safer operations for pedestrians and bicyclists compared to typical roadway designs. In addition to the non-traditional designs, increasingly, GDOT projects include accommodations for bicycle, pedestrian, bus, and rail transit systems. All of these considerations must be weighed by the TFE during the traffic forecasting process for GDOT projects where they are relevant. For these situations, the TFE should consult the GDOT Office of Planning's design traffic group and the GDOT Project Manager for guidance.

FHWA has developed informational guides for some of these unconventional designs, including displaced left-turn (DLT) intersections (also called continuous flow intersections (CFIs)), restricted crossing U-turn (RCUT) intersections, median U-turn (MUT) intersections, quadrant roadway (QR) intersections, and double crossover diamond (DCD) interchanges (also called diverging diamond interchanges (DDIs)).

When an unconventional design is under consideration, the basic principles for forecasting traffic volumes should be no different than for a conventional design. Design traffic forecasting is a process that estimates demand for different modes of transportation (including vehicles of various types, pedestrians, bicyclists, transit users, etc.) who will use a specific transportation facility. Therefore, the process for developing future forecasts for roadway segments remains the same for both conventional and unconventional designs. Similarly, the number of vehicles that would turn left or right or

go through at an intersection should be treated the same way in the forecasting process regardless of the intersection design.

There is one additional aspect of the forecasting process for unconventional designs that should be considered – this is the reassignment of the forecasted volumes to match the movements allowed by the unconventional design. It is the TFE's responsibility to reassign the volumes to match the movements allowed in an unconventional design during the evaluation of various Build alternatives.

For example, at certain median U-turn intersections (MUTs), left-turns are not allowed at the intersection. However, such movements have to go through the intersection and execute a U-turn at a downstream location to travel back toward the intersection where vehicles make a right-turn movement. Similarly, this same left-turn movement in a quadrant road (QR) design is accomplished by a through movement followed by a series of right-turn movements back towards the initial intersection, where they become a through-movement on the intersecting roadway. The traffic reassignments associated with the non-traditional design must be accounted for by the TFE.

In general, traffic forecasts should not change whether a roadway, intersection or interchange has a conventional or unconventional design. However, when a proposed improvement is expected to result in increased capacity, it could attract traffic from a parallel facility. ***The traffic forecasting process should account for this and make any adjustments to reflect changes in capacity due to an unconventional design, similar to adjustments made for a conventional design.*** Guidelines for such adjustments to volumes are discussed in the following section.

5.8.2 New Roadway Corridors, Including Bypasses

Traffic projections for a new roadway or bypass route can be determined based upon traffic counts on adjacent streets, an origin-destination study that includes surrounding streets (also known as a cordon line analysis), or from the MPO transportation model if available. The percentage of traffic that will be relocated to the new route can be determined in several ways.

Within the MPO area, the transportation model should be used to determine the amount of traffic on a new bypass route. Typically, new roadways, including bypasses, are already included in the MPO model. If this is not the case, the new route should be added to the future year model to determine the design year traffic volume. If the model is calibrated, the design traffic volumes can be obtained directly from the loaded model network. If the model has not been calibrated, the TFE should consider comparing the outputs from the different models in order to get an estimated increment of traffic that will likely be diverted to the new facility.

For a minor bypass route, existing traffic counts obtained on nearby roadways will generally show a trend that can be used to determine how much of the traffic would utilize the bypass and how much traffic would be distributed to the local network of the community being bypassed. A more accurate determination of the percentage of traffic

that would use a bypass route within a non-urbanized area is achieved by conducting an origin-destination study.

Refer to the current Institute of Transportation Engineers (ITE) Manual of Transportation Engineering Studies for procedures for conducting an origin-destination study. Additional methods for conducting origin-destination studies include the use of license plate video capture, global positioning system (GPS) tracking, and cellular phone data. The TFE should discuss the potential methodologies to gather this data with the GDOT design traffic group for its approval.

5.9 Reasonableness of Traffic Forecasts

Once traffic growth rates have been developed in accordance with the GDOT approved traffic forecasting methodology, future traffic volumes for several sections along the project should be calculated and compared with traffic volume projections from the calibrated MPO model, where available. As a rule of thumb, the two projections should be within ten percent (10%) of each other. If they are not, the TFE should review the disparity and propose an explanation for the disparity. ***It is important to consider whether or not the future roadway can handle the expected traffic volumes. The TFE should address this issue in the forecasting documentation. Future traffic volumes should be compared to per-lane capacity limits shown in the Highway Capacity Manual (HCM). Adjustments may be necessary because of limited road capacity. If adjustments are made due to capacity constraints, these should be documented in the Traffic Forecast Report prepared by the TFE for the project.***

5.10 Adjustments to AADT Volumes

For some roadway design projects, there may be a need to adjust the forecasted traffic volumes. These adjustments will be required only in anticipation of major land developments or significant changes in nearby street/highway networks that will affect future traffic volumes expected on the roadway under design. If the MPO model was used to develop the growth rates or volumes, the TFE should ensure that the anticipated developments or roadway changes have not already been accounted for in the model. Adjustments in traffic volumes for major land use changes (new developments or redevelopments) should follow all procedures established by the GDOT Office of Planning's design traffic group, and the proposed impacts to the traffic volumes should be documented in the Traffic Forecasting Report developed by the TFE. All traffic diagrams should reflect the approved adjusted volumes.

5.11 Intersection Turning Movements

For forecasting purposes, turning volumes at intersections can be assumed to be in the same proportion for the future years (Base Year and Design Year). For new intersections or for those significantly impacted by new land developments or major changes in nearby street/highway networks, turning percentages will need to be reassigned based on the new developments or changes (or based on a traffic impact analysis conducted for those new developments). Lacking any other information and data, sound engineering judgment should be used by the TFE, and all decisions should be documented in the Traffic Forecast Report, including those related to reassigning vehicle trips from the nearby street network to derive the turning movements at project intersections. The TFE should also evaluate the reasonableness of the growth rate for each intersection and make adjustments as appropriate. For example, a built-out subdivision may have little growth, if any, while other roads in the same general vicinity might grow at a higher rate. The TFE should use professional judgment and fully document any turning movement adjustments in the Traffic Forecast Report for GDOT approval.

5.12 Traffic Forecasting Deliverables

The TFE should refer to Section 7 of this document for information on the required traffic forecasting deliverables and their formats.

In order to assist consultants responsible for design traffic forecasting work, an overview of the forecast development process is included in Figure 4.

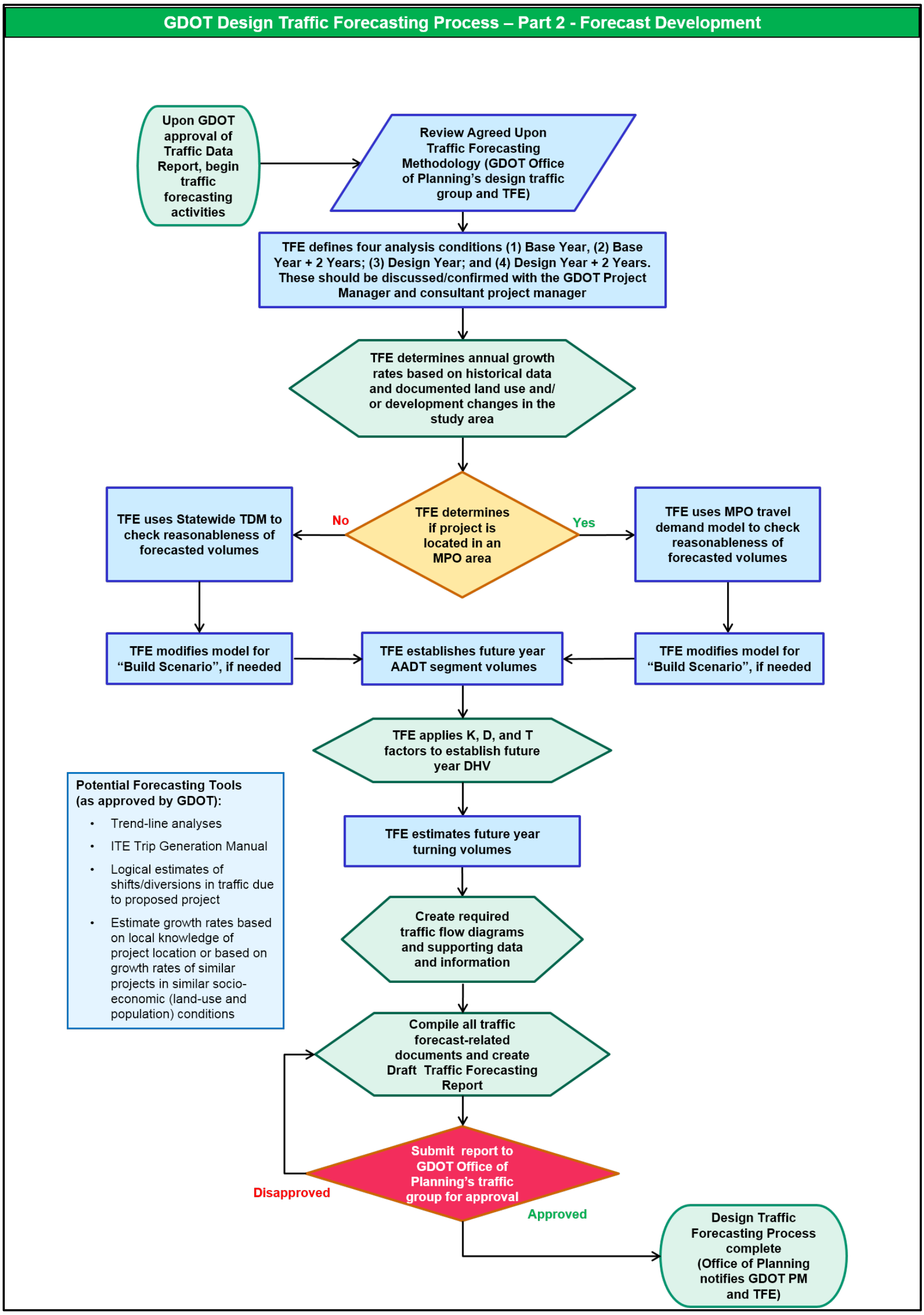


Figure 4. GDOT Design Traffic Forecasting Process – Part 2 - Forecast Development

SECTION 6: DESIGN TRAFFIC FORECASTING TOOLS AND CONVENTIONS

This section provides information on the recommended tools and methods that should be used to conduct traffic data analysis and forecasting activities for GDOT projects, including the use of Metropolitan Planning Organization (MPO) travel demand forecasting models (for urbanized areas); GDOT's Statewide Travel Demand Model (GSTDM) for non-urbanized areas; guidance related to the consideration of truck volumes and movements; and the numerical rounding conventions used by GDOT in its technical analyses related to traffic.

6.1 Use of MPO Area Travel Demand Models

Urban area travel demand models are valuable tools for TFEs to use in checking the reasonableness of traffic data and forecasted volumes as well as for evaluating future traffic volumes on new facilities. The models for most of these urbanized or "metropolitan planning organization" (MPO) areas, with the exception of Metro Atlanta and the Chattanooga MPO areas, are developed and maintained by the GDOT Office of Planning. As the federally-designated MPO for the 20-county Atlanta region, the Atlanta Regional Commission (ARC) is responsible for developing and maintaining its multimodal, financially constrained, long-range transportation plan that meets all federal transportation planning requirements and all related federal laws, such as the Clean Air Act, among others. The northern portions of Catoosa, Walker, and Dade Counties in Georgia are part of the Chattanooga-Hamilton County Regional Planning Commission in Tennessee, which serves as the MPO for that area. Each of the MPOs in Georgia and their respective counties can be found in Appendix C.

These models are used by a variety of transportation professionals across Georgia including GDOT headquarters and district offices, MPOs, local governments, and the private sector. Under federal law, MPOs are responsible for: (1) leading the development of a long-range transportation plan (LRTP) having a plan horizon year of at least 20 years for its designated urbanized area; (2) developing a comprehensive list of all programmed transportation projects to be carried out during the next four to five years, known as the MPO's Transportation Improvement Program (TIP); and (3) implementing an open, inclusive public outreach process that enables all interested parties from all sectors of the MPO community to participate in the development of its LRTP and TIP and their related policies.

There are currently 16 MPOs in Georgia that are designated by the U.S. Department of Transportation (USDOT) and include contiguous urban areas with populations of at least 50,000 people. The sixteen urbanized areas may encompass one or multiple counties, portions of counties, or portions of other states. It should be noted that approximately two years after each decennial U.S. Census is conducted, new MPOs are designated and could be relevant to the GDOT traffic data and forecasting process for individual projects in the future.

The MPO regional travel demand forecasting models are used to estimate future traffic volumes over a planning horizon period of at least 20 years. The models estimate future traffic volumes on the segments of a functionally classified road network (expressways/freeways, including interstate highways; major and minor arterial roads; and collector roads). It is also a tool that can be used by the TFE as a secondary source of information to assess the reasonableness of future design traffic forecasts.

For planning purposes, GDOT has established a set of eight modeling scenario networks for each MPO area that represent various combinations of planned and programmed projects. GDOT supports these scenario networks with technical modeling services. The first network (Network 1) corresponds to the existing roadway network, and the remaining seven networks correspond to various future long-range transportation plan (LRTP) networks. Base Year and Future Year socio-economic data are also available within the model structure, including estimates of population, households, employment, median household income, and school enrollment for each traffic analysis zone (TAZ).

Each MPO model and the eight associated scenario networks are updated and maintained by GDOT every four to five years to provide a technical tool during their federally-mandated LRTP updates. MPOs are the primary driver of the model and are responsible for developing the socio-economic data and project list for the base year model and each of the scenarios. The socio-economic data is comprised of an estimate of current data and a projection of socio-economic data 20 to 30 years into the future. MPOs are also responsible for utilizing the travel demand model results to evaluate the performance of the transportation system in and around the MPO area and for including necessary model information and data in their LRTP documentation for public review.

The eight standard networks are described in more detail below. Networks 2 through 8 build upon and address capacity deficiencies of lower-numbered networks.

- ***Base Year (Network 1)*** - This network should include all functionally-classified roads (usually collectors, arterials, and freeways) in the MPO study area open to traffic in the Network 1 Base Year. Local roadways may appear in the base year network, but are not required. Once this network is calibrated, it should replicate the travel patterns that existed in the Base Year. It should be noted that the Network 1 Base Year often differs from a project's base year, in which case, an adjustment must be made before using the network for traffic data forecasting tasks.
- ***Do-Nothing System Projects (Network 2)*** – Also known as the "No Build" scenario, this network is intended to show what would happen in the horizon year (i.e., LRTP plan year) if no new projects were built. Network 2 basically reflects the current transportation system with resulting capacity deficiencies from future demand due to population and employment increases. Network 2 consists of the base year network plus any projects opened to traffic since the base year, or projects currently under construction.
- ***Existing + Committed System Projects (also called the E+C Network - Network 3)*** - This network is intended to show what would happen in the future on

the transportation network if only existing and presently committed projects are built. Network 3 basically reflects "committed" short-range improvements. Committed projects are defined as those projects in the current State Transportation Improvement Program (STIP) or the Transportation Improvement Program (TIP) of the relevant MPO. Projects identified in the STIP or TIP and included in the E + C Network must have the construction phase programmed (i.e. funding must be identified). Projects with only preliminary engineering (PE) and right of way (ROW) phases funded in the STIP or TIP are not considered "committed". Thus, LRTP projects beyond the horizon year of the STIP or TIP would not appear in this network.

- ***Remainder of TIP (PE, ROW) and TIER 2 Projects and Construction Work Program (CWP) Projects (Network 4)*** - Network 4 reflects previously programmed mid-range improvements. Network 4 includes programmed projects from TIER 2, the second phase of the TIP document (consisting of the last three years). Programmed projects in TIER 2 should coincide with the last three years of the CWP. Projects with ROW and PE funds in these years would be included in this network. MPOs sometimes place "desired" projects in the TIER 2 section of the TIP document without an identified dedicated funding source. If a project has not been programmed (does not have a GDOT PI number) or does not have locally dedicated funds allocated, it should not be included in this network.
- ***Remainder of Programmed LRTP Projects (Network 5)*** - Network 5 reflects programmed long range projects from the MPO's current LRTP that are programmed by GDOT as "long range (LR)." Current LRTP projects that are not yet programmed (i.e. that do not have have funding source(s) identified) are not to be included in Network 5. If local jurisdictions have a method of documenting programmed local projects already included in the current LRTP, those projects can be included in this network.
- ***Remainder of LRTP Projects (Network 6)*** - This network includes projects in the current LRTP that have not been captured in any of the previous networks. For example, Network 6 includes projects listed in the current LRTP that have not advanced from their status as LRTP "recommendations." Projects that have not advanced from a status in the LRTP as "Recommended" are not part of the LRTP financially constrained list. It should be noted that if time for completing the traffic forecasting is limited, Networks 5 and 6 may be combined.
- ***Financially Constrained Projects (Network 7)*** - This network includes all projects that are recommended in the financially constrained plan through the LRTP's project evaluation process. The financially constrained plan is required to undergo public review and comment.
- ***Recommended Financially Constrained Plan – Post Public Comment (Network 8)*** – Upon reviewing and responding to public comments received on the draft LRTP, the MPO's staff or committees may request network revisions or additional scenarios. If significant changes are made - for example, if new projects

are included that were not previously presented to the public - then additional public comment may be needed. If the public had the opportunity to comment on the projects proposed for revision, additional public comment may not be needed. These decisions are made by the MPO. Whatever action is decided, it must be consistent with the MPO's adopted Public Involvement Process (PIP). The final network must be consistent with the financially constrained LRTP adopted by the MPO Policy Committee.

For a proposed project located on an existing roadway, the TFE can use the E+C Network (Network 3) to estimate future traffic volumes. For a new roadway project or a roadway not included in the E+C Network, Network 7, representing the financially constrained transportation plan network, should be used for comparison purposes to traffic forecasts.

6.2 Use of the Georgia Statewide Travel Demand Model

In 2010, GDOT initiated the development of the Georgia Statewide Travel Demand Model (GSTDM) to help evaluate the impacts of major transportation infrastructure and land use investment strategies at the state level. Since then, it has been used for many statewide planning projects and other technical purposes. The GSTDM can be obtained from the GDOT Office of Planning (State Planning Administrator).

The GSTDM has the capability to evaluate major intercity auto and freight travel patterns and assess mode shift among highway, transit, and rail. The GSTDM should not be used for forecasting detailed personal vehicle and intermodal freight travel patterns and demands, or for the identification of operational bottlenecks within MPO areas.

6.3 Consideration of Truck Volumes and Movements

Accurately accounting for truck travel and freight movement needs is a very high transportation priority in Georgia. Appropriate data sources must be used to determine 24-hour and peak-hour truck percentages. As described previously, the traffic counts undertaken by the TFE should include truck volume counts, where appropriate. Truck traffic counts should be compared to any nearby GDOT count locations to ensure they are reasonably in line with previous data collection efforts. Truck classification counts should also be obtained for the mainline, all state routes, and all ramps as well as any significant side roads, if appropriate. Generally, the future truck percentage should remain the same as the existing truck percentage unless the future condition is expected to change as documented by the TFE.

Additionally, the TFE should review historical truck traffic trends based on nearby count stations as well as the Georgia Statewide Freight Plan for information and data on future trends. In the Traffic Forecasting Report submitted to the GDOT traffic group for review and approval, the TFE should state whether the truck volumes will grow at the same rate as other vehicles and whether this growth will be linear or exponential. The 24-hour percentage should be given for Single Unit (SU) trucks (FHWA Classes 4 through 7) and

for Multi-Unit or Combination (Comb) trucks (FHWA Classes 8 through 15). Single Unit trucks include buses. The peak-hour truck volumes and percentages should be given as Single unit (SU) trucks and Combination (Comb) trucks. Refer to Figure 5 for the FHWA Truck Vehicle Classification Scheme for guidance.

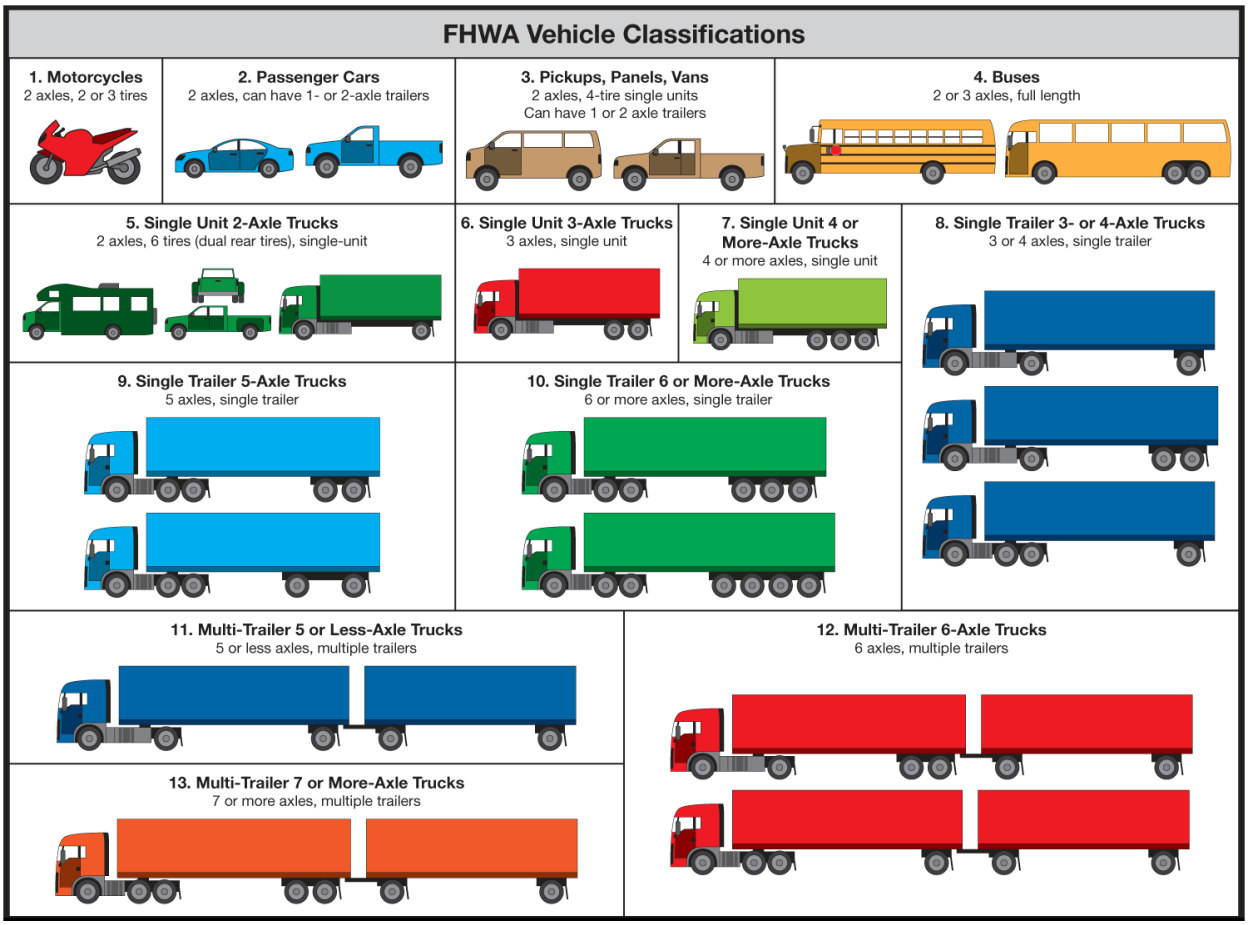


Figure 5. FHWA Truck Vehicle Classification Scheme

SECTION 7: REQUIRED STANDARDS AND FORMATS FOR DESIGN TRAFFIC DELIVERABLES

This section describes the required standards, traffic data analysis and forecasting deliverables, and the required formats to be used by TFEs in the development of all design traffic-related documentation. Some examples of these standards, deliverables, and formats can be found in Appendix E.

7.1 Traffic Flow Diagram Documentation Standards

The following standards and conventions should be used throughout the traffic data analysis and documentation activities in order to expedite GDOT approval of the documents.

- Annual Average Daily Traffic (AADT) volumes should be rounded to the nearest 25
- Design Hour Volumes (DHVs) should be rounded to the nearest 5
- Truck percentages should be rounded to the nearest 0.5%. Both Single Unit (SU) trucks (FHWA Classes 4 through 7) and Multi-Unit or Combination (Comb) trucks (FHWA Classes 8 through 15) should be provided for AADT and DHV traffic flow diagrams
- Show minimal movement volumes that are less than 25 vehicles per day as MM (instead of zero – twenty four (0 - 24)) for for AADT traffic flow diagrams
- Show minimal movement volumes that are less than 5 vehicles per hour as MM (instead of zero –four (0 - 4)) for for DHV traffic flow diagrams
- AADT traffic flow diagrams should have the volumes represented as (Design Year)/Base Year on each sheet. Do not separate design year and base year sheets
- DHV traffic flow diagrams should have the volumes represented as (PM)/AM on each sheet. Do not separate AM and PM sheets
- Use GDOT standard file format and cell libraries in Microstation
- Include the company name of the project consultant, project identification number (P.I.#), County, and a directional arrow on all traffic flow diagrams
- Initial and date all traffic flow diagram updates and quality control checks in the appropriate area of the traffic sheets

All TFEs and GDOT and consultant PMs should monitor the GDOT webpages with traffic-related resources to verify the latest standards for traffic-related documents.

7.2 Traffic Data Report Requirements and Deliverables Checklist

The TFE is responsible for preparing the draft and final Traffic Data Report and the Traffic Forecasting Report, which should include all of the GDOT required items. As stated previously, all documents should clearly state the following information:

- Roadway Title Section
- Project Identification Number (P.I.#)
- County
- Current Date
- Discussion of development trends in the project area
- Latest census data
- Travel demand model data (MPO or Statewide TDM, as applicable)
- Related studies, analysis, or other information
- Discussion of the traffic growth rate and the rationale for it

The draft Traffic Data Report should include an Appendix where the following items will be found:

- Existing condition traffic flow diagrams (AADT and DHVs)
- Approved traffic count location map
- Actual traffic counts conducted by the TFE
- Field inspection report
- K and D factor calculation tables for all counts in required format
- Truck percentage calculation chart in required format

In order to expedite the review and approval of GDOT traffic-related deliverable, a checklist has been developed for use by TFEs and the GDOT Office of Planning's traffic group to conduct a "completeness review" of the documents to be submitted for GDOT review/approval. Submittals received by GDOT that lack any of these items will be returned to the TFE by the GDOT Office of Planning's traffic group. This checklist can be found in Figure 6. Examples of deliverables meeting GDOT's requirements can be found in Appendix E.

Roadway Title Section/Project Description:	PI No:	Date of Check:
County Name:	MPO Area (if any):	
GDOT Project Manager and Contact Information:		
Consultant Project Manager and Contact Information:		
TFE Firm, TFE, and Contact Information:		

√ if complete	Phase 1: Traffic Data Report Contents	Date Complete
	Discussion of Project (type, limits, purpose, etc.)	
	Discussion of Related Projects (i.e. other projects planned or programmed in the area)	
	Traffic Count Location Map	
	Field Visit Report	
	Send Traffic Count Location Map for GDOT Approval	
	Conduct Traffic Counts (raw counts)	
	K and D Factor Calculation & Truck Percentage Calculation Table (see Appendix E)	
	Discussion of existing conditions and development trends/ activities in the area	
	Latest US Census data and other data pertinent to the design traffic forecast	
	MPO or GDOT Statewide Model data, as applicable	
	GDOT Historical and Growth Rate Analysis Based on Actual Counts (see Appendix E)	
	Project Area Development Growth Rate Analysis for Build and No Build Cases	
	Blank Build Traffic Layout Sheets	
	Related Studies (if applicable)	
	Proposed Traffic Forecasting Methodology and Parameters	
	Appendices (i.e. existing traffic diagrams, traffic count map, raw traffic counts, site visit report, K and D factor calculation tables for all counts; truck percentage calculation table; GDOT historical count data table; etc.)	
√ if complete	Phase 2: Traffic Forecasting Report Contents	Date Complete
	Existing AADT and DHV (discussion and traffic diagrams)	
	Send memo on Existing AADT and DHV and Build Layout for GDOT approval	
	Base Year and Design Year "No Build" AADT and DHV	
	Base Year and Design Year "Build" AADT and DHV	
	Base Year + 2 and Design Year + 2 "Build" and "No Build" AADT and DHV	
	All items compiled and appropriately labelled and produced within the completed Traffic Data and Forecasting Report document (including Appendices)	
	Submit full documentation and MicroStation file (traffic package in PDF)	

_____ _____

Name of Traffic Forecasting Engineer/Firm Name Date of Submission

_____ _____

Name of GDOT Office of Planning Design Traffic Group Reviewer Date of Acceptance

Figure 6. GDOT Design Traffic Deliverables Checklist/Completeness Check

7.3 Timing of Deliverables

In order to process the required traffic-related documents as quickly as possible to support efficient project delivery, it is critically important for all parties (GDOT, consultant, and TFE) to adhere to the mutually agreed-upon schedule for delivering traffic-related documents established at the outset of the efforts. TFEs should expect to produce a minor deliverable within 10 business days (unless otherwise agreed to by the GDOT traffic group), and major deliverables should be developed within 90 calendar days (excluding summers and holidays when traffic counts cannot be taken), unless otherwise approved by the GDOT traffic group.

SECTION 8: DESIGN TRAFFIC REVIEWS

The GDOT Office of Planning's design traffic group is responsible for reviewing all consultant deliverables pertaining to design traffic forecasting. A summary of the key requirements for the review of design traffic deliverables is provided in this section.

8.1 Design Traffic Review Requirements

The following requirements apply to all GDOT design traffic deliverables as described in Tables 4 through 7.

Table 4. Design Traffic Review Requirements – Traffic Count Rules

Traffic Count Rules
Minimum 48 hour bi-directional counts are required on all road segments within the project description area with an expected traffic volume of 50 vehicles per day (VPD) or more.
The traffic counts in the project must include the intersections or interchanges at the ends of the project (as stated in the project description). For example, for a project called "I-16 @ I-95 to I-516", the entire I-16 @ I-95 interchange and the whole I-16 @ I-516 interchange must be included in the traffic count collection.
Additional counts outside of the project area may be required for logical termini or other reasons on an as needed basis. Additional count requirements will be listed on the Traffic Projections Review Request Form submitted by the GDOT PM or other GDOT personnel to the GDOT Office of Planning's design traffic group (see Appendix E for standard request form).
Gravel roads within the project area that have an expected volume of 50 vehicles per day (VPD) or more should be counted.
All legs of the intersection in a project area should have AM and PM turning movement counts during the three-hour AM peak period and three-hour PM peak period.
The TFE should choose the turning movement count hours by checking the hours of highest AM and PM traffic volume for the most recent actual counts for GDOT traffic counters in the project area as shown on the GeoCounts website. Figure 2 shows a screenshot of the GeoCounts website.
After collecting all of the traffic counts, the TFE should choose the AM and PM peak hours should be based primarily on the hours with the highest mainline counts. The Design Hour Volumes (DHV) traffic should be based on the counts at the selected AM peak hour and the selected PM peak hour.
Vehicle classification counts should be done: On mainline at the beginning and at the end of each project On all state routes in the project area On any road with an expected high volume of trucks, i.e. near ports, truck stops, distribution centers, rest stops, etc. On all ramps in the project area
For projects where interstates or other limited access facilities are within the project area, traffic counts along these facilities should be taken if possible. Since tube counters are not reliable for these situations video counts can be used. If it is not possible to conduct video counts, use the data from the nearest GDOT count location.
Traffic counts for one way in/one way out subdivisions may be estimated using the most recent version of the Institute of Traffic Engineers (ITE) Trip Generation Manual. All estimates must be documented in the Traffic Data Report. However, it is preferable to do actual counts whenever possible to expedite GDOT's approval of the traffic data.

Traffic counts should be taken for commercial driveways where the counts would contribute to the understanding and documentation of the project area traffic movements.

Counts from multiple years should not be used to develop existing traffic. All counts should be done in the same year, preferably in the same week.

Counts for existing traffic should not be more than five years old. Although it is preferable to have existing traffic counts for the current year, existing traffic from previous work can be used if the supporting traffic counts are within four years of the current year and the most recent coverage counts of the project area do not show more than a 10% deviation from the previous traffic work not including year to year growth.

If any atypical situations are present in the project area, the GDOT Office of Planning's design traffic group should be consulted for guidance on the number, type, extent, and location of traffic data to be collected.

Table 5. Design Traffic Review Requirements – Traffic Data Report Requirements

Traffic Data Report Requirements

The traffic data report should include a project description and short discussion of project purpose. It should also include any notable facts from the field trip and related projects, mainline K & D factor results, mainline truck percentage results, growth rate development discussions for both the No Build and Build cases, and references in the appendices. Please follow this format for the traffic memo:
 	
▪ Title Section
▪ Project Description
▪ P. I. #
▪ County
▪ Current Date
▪ Project, project purpose, related projects, project area, field trip, and count map discussion
▪ Assumptions discussion – include development, new roads, traffic diversions, etc.
▪ K and D factor discussion and summary chart with mainline K and D for No Build and Build cases
▪ Truck percentage discussion stating mainline truck percentages and any truck related facilities in the project area
▪ Growth rate development discussion for No Build and Build cases with a chart of the mainline No Build and Build existing to base year and base year to design year growth rates
▪ Discussion of development trends in the project area
▪ Latest census data
▪ Travel demand model data (MPO or Statewide TDM, as applicable)
▪ Related studies, analysis, or other information
▪ Traffic Sheets (Existing condition traffic flow diagrams including AADT and DHVs)
 	
▪ Appendices
  ▪ Traffic Projections Review/Request Form
  ▪ Traffic Count Map
  ▪ Field Trip Report
  ▪ Raw Counts
  ▪ K and D calculation chart for all counts in required format
  ▪ Truck Percentage calculation chart in required format
  ▪ Growth Rate Analysis References
  ▪ GDOT Historical Traffic Counts and Consultant Actual Counts Growth Rate Calculations
  ▪ Project Area Development Findings
  ▪ Census/Population Data
  ▪ Model data (if applicable)
  ▪ Related Studies or additional information used

Table 6. Design Traffic Review Requirements – Document Standards

Document Standards
▪ Annual Average Daily Traffic (AADT) volumes should be rounded to the nearest 25. ▪ Design Hour Volumes (DHVs) should be rounded to the nearest 5. ▪ Truck percentages should be rounded to the nearest 0.5%. Both Single Unit (SU) trucks (FHWA Classes 4 through 7) and Multi-Unit or Combination (Comb) trucks (FHWA Classes 8 through 15) should be provided for AADT and DHV traffic flow diagrams. ▪ Show minimal movement volumes that are less than 25 vehicles per day as MM (instead of zero – twenty four (0 - 24)) for AADT traffic flow diagrams. ▪ Show minimal movement volumes that are less than 5 vehicles per hour as MM (instead of zero –four (0 - 4)) for DHV traffic flow diagrams. ▪ AADT traffic flow diagrams should have the volumes represented as (Design Year)/Base Year on each sheet. Do not separate design year and base year sheets. ▪ DHV traffic flow diagrams should have the volumes represented as (PM)/ AM on each sheet. Do not separate AM and PM sheets. ▪ Use GDOT standard file format and cell libraries in Microstation based on the latest versions. ▪ Include company name, project ID, project PI #, County, and a directional arrow on all traffic sheets and initial and date all traffic sheet updates and quality control checks in the appropriate area of the traffic sheets.

Table 7. Design Traffic Review Requirements – Required Design Traffic Deliverables

Required Design Traffic Deliverables
It is GDOT's intention to expedite the design traffic projections review process through an agreed upon deliverables-based process for consultant traffic review work as follows: ▪ Complete Traffic Data Report With Appendices (See Traffic Data Report Requirements) ▪ Traffic Projections Review/Request Form ▪ Existing AADT and DHV ▪ Base Year And Design Year No Build AADT And DHV ▪ Base Year And Design Year Build AADT and DHV ▪ Plus 2 Base Year And Design Year No Build AADT And DHV ▪ Plus 2 Base Year And Design Year Build AADT And DHV ▪ Traffic Count Map ▪ Field Trip Report ▪ Raw Counts ▪ K and D Calculation Chart ▪ Truck Percentage Calculation Chart ▪ GDOT Historical And Consultant Actual Count Growth Rate Analysis ▪ Project Area Development Growth Rate Analysis ▪ Census Data ▪ Model Traffic Data (If applicable) ▪ Related Studies (If applicable)

Figures 7 through 18 provide illustrations of sample design traffic deliverables.

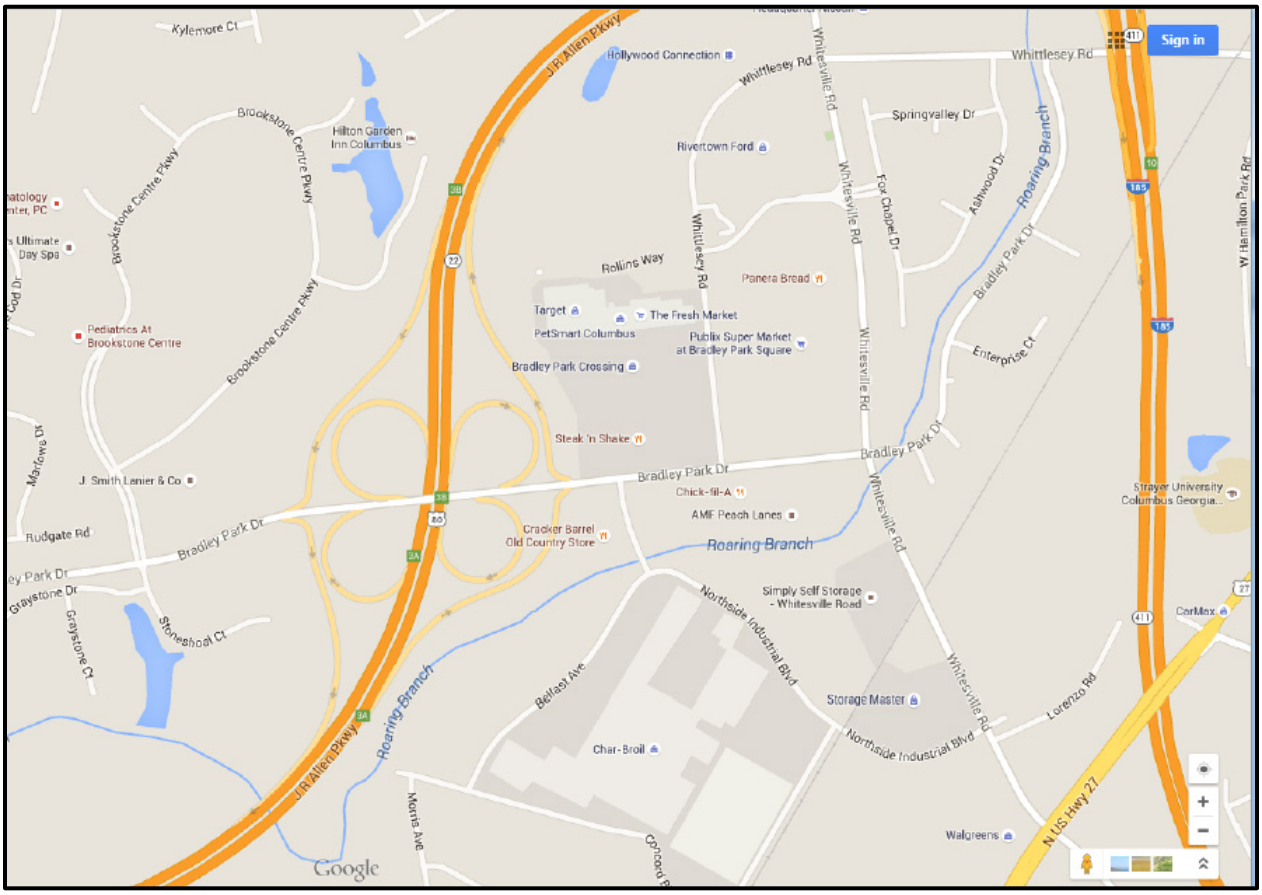


Figure 7. Sample Project Location Map

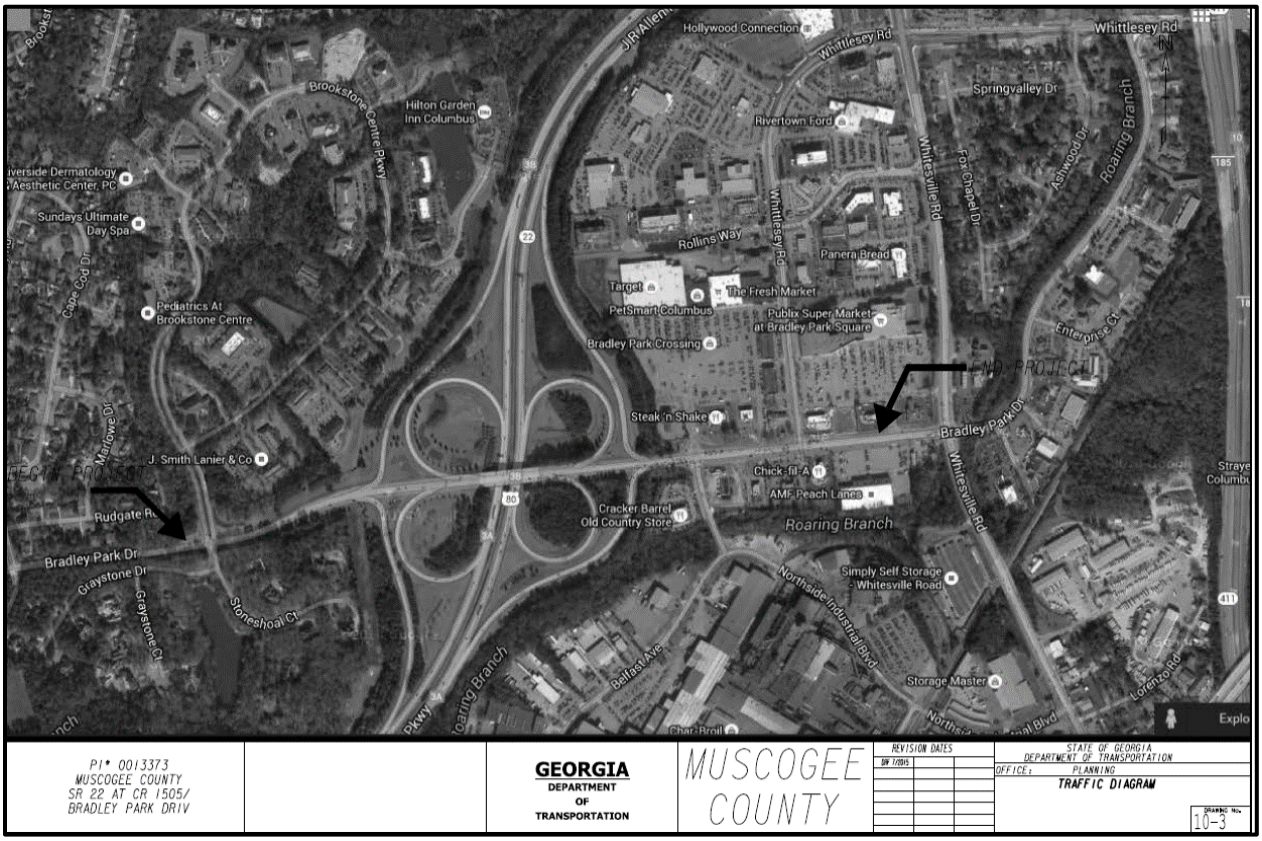


Figure 8. Sample Project Location Map on Aerial

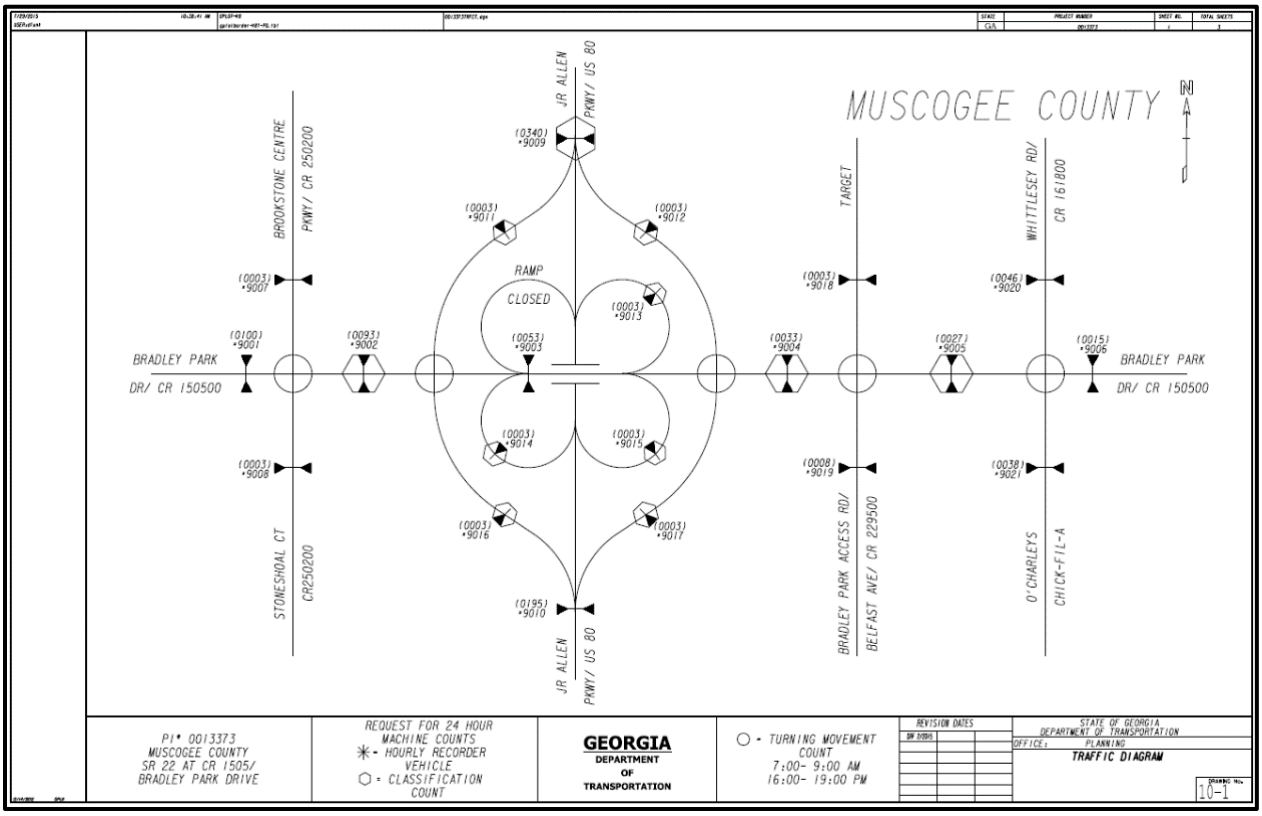


Figure 9. Sample Traffic Count Location Map

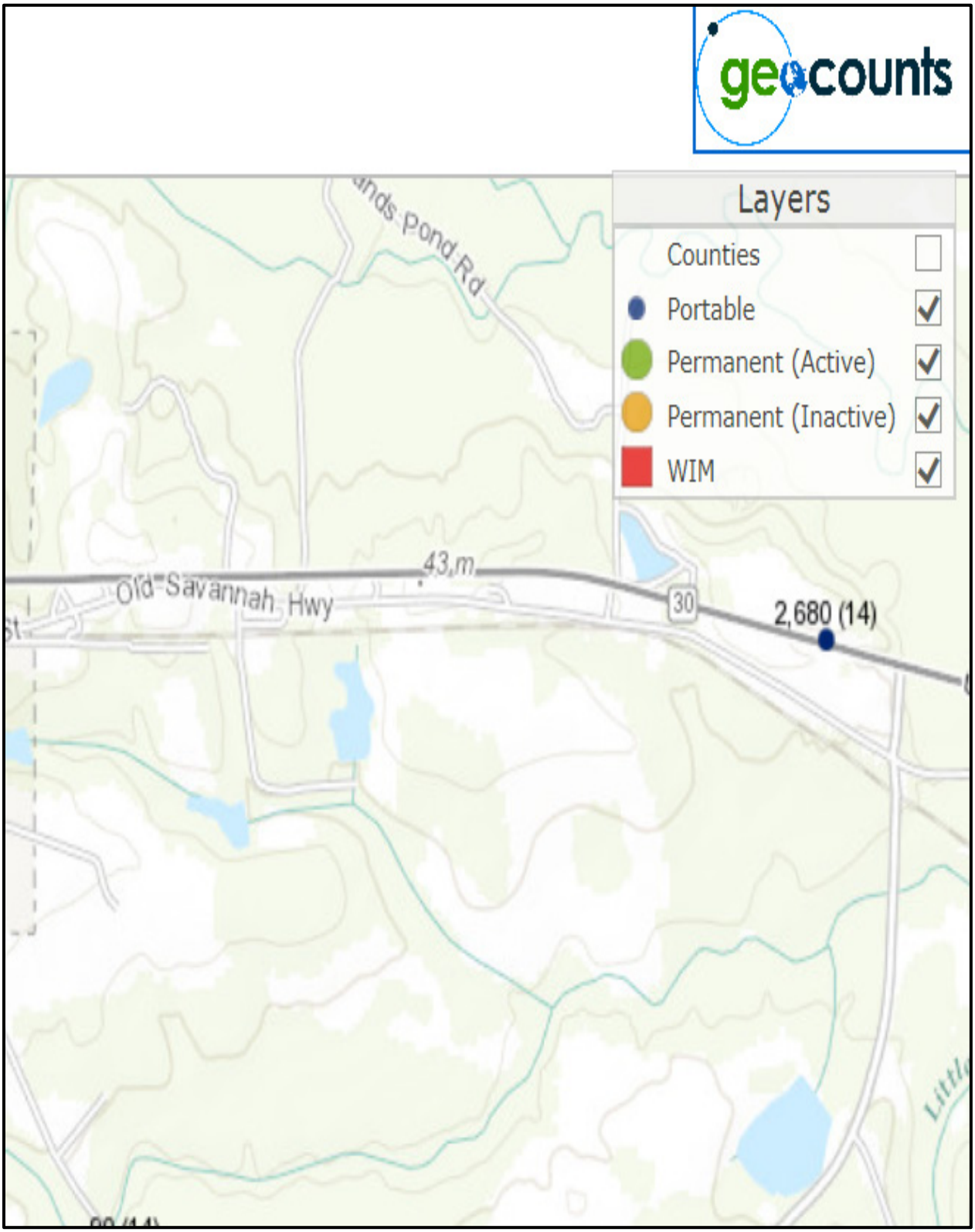


Figure 10. GDOT GeoCounts – Map of Automated Traffic Count (ATR) Locations

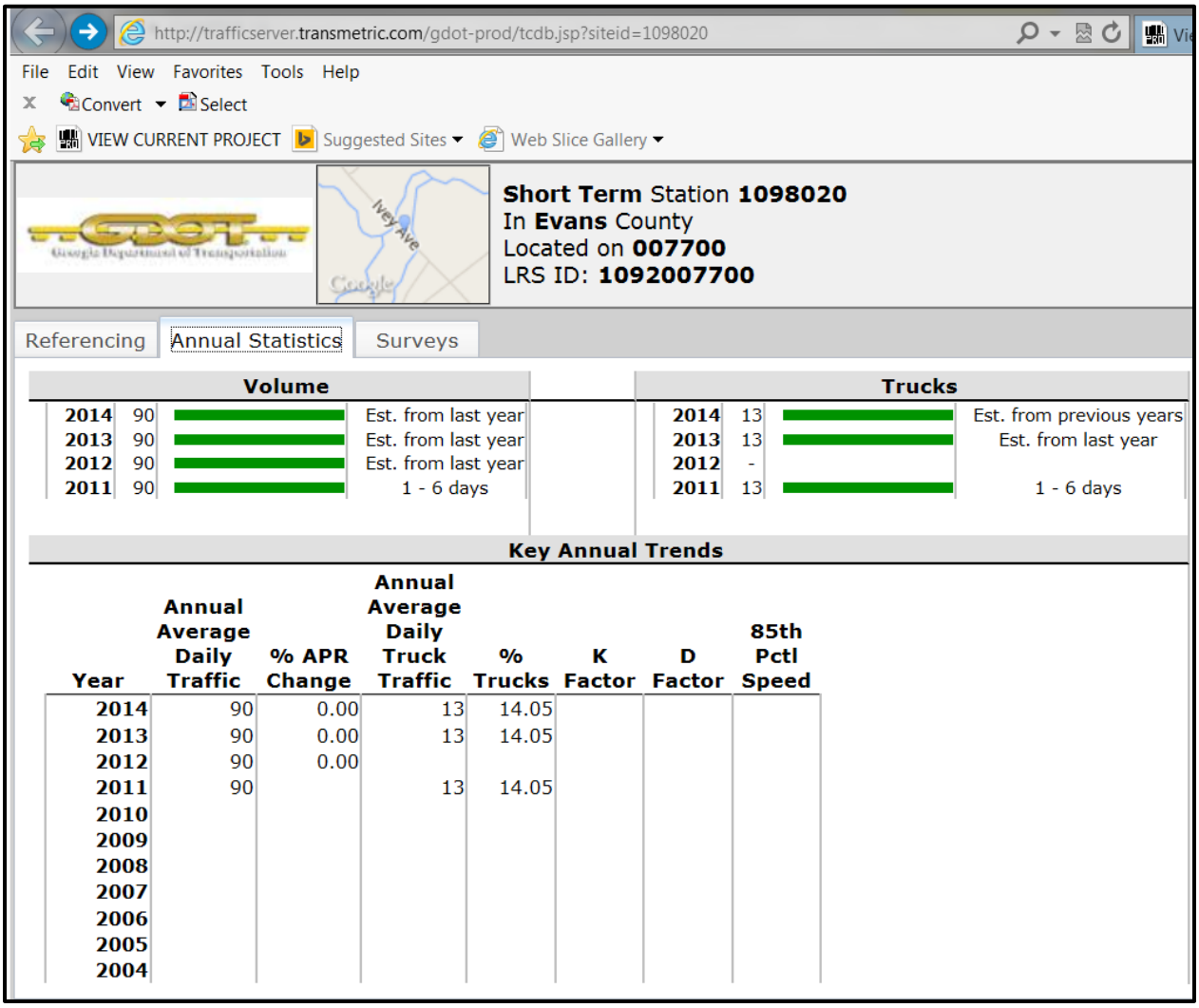


Figure 11. GeoCounts – Portable Station with Classification Count

Referencing | Annual Statistics | Surveys

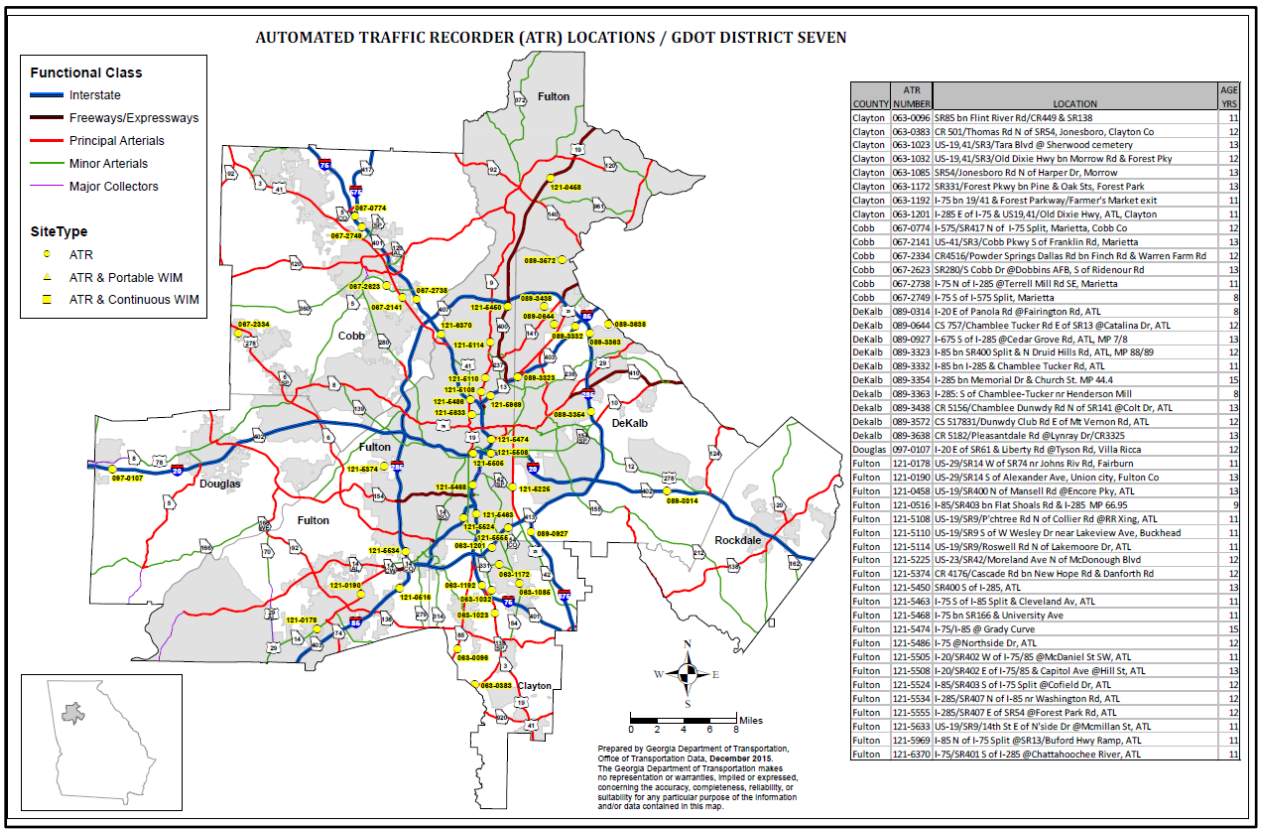
Year	Month	Office Status	Summary	Volume By Hour	Class By Hour	Speed	Turning Movements
2011	Oct	Count accepted	Summary | By Day	All | North | South	All | North | South	All | North | South	
2015	May	Count accepted	Summary | By Day	All | North | South	All | North | South	All | North | South	

Class By Hour

Direction: All Directions

Class	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Vol	Trucks	CU	% Tr	% CU	Graphic
Monday Oct 17, 2011																					
10:00 AM	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0			
11:00 AM	0	6	2	0	1	1	0	1	0	0	0	0	0	0	0	**11**	3	1	27.3	33.3	
12:00 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2	1	0	50.0		
13:00 PM	1	3	4	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0			
14:00 PM	0	3	3	0	1	0	0	0	0	0	0	0	0	0	0	7	1	0	14.3		
15:00 PM	0	5	4	0	2	0	0	0	0	0	0	0	0	0	0	11	2	0	18.2		
16:00 PM	0	2	3	0	1	0	0	0	0	0	0	0	0	0	0	6	1	0	16.7		
17:00 PM	0	4	1	0	1	0	0	0	0	0	0	0	0	0	0	6	1	0	16.7		
18:00 PM	0	1	1	0	0	3	0	0	0	0	0	0	0	0	0	5	3	0	60.0		
19:00 PM	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0			
20:00 PM	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0			
21:00 PM	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0			
22:00 PM	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0			
23:00 PM	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0			
Daily Total	1	38	25	0	7	4	0	1	0	0	0	0	0	0	0	76	12	1	15.8	8.3	
Tuesday Oct 18, 2011																					
00:00 AM	0	1	4	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0			
01:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0			
02:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
03:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
04:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
05:00 AM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0			
06:00 AM	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0			
07:00 AM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0			

Figure 12. GeoCounts – Portable Station Sample Data



COUNTY	ATR NUMBER	LOCATION	AGE YRS
Clayton	063-0096	SR85 bn Flint River Rd/CR449 & SR138	11
Clayton	063-0383	CR 501/Thomas Rd N of SR54, Jonesboro, Clayton Co	12
Clayton	063-1023	US-19,41/SR3/Tara Blvd @ Sherwood cemetery	13
Clayton	063-1032	US-19,41/SR3/Old Dixie Hwy bn Morrow Rd & Forest Pky	12
Clayton	063-1085	SR54/Jonesboro Rd N of Harper Dr, Morrow	13
Clayton	063-1172	SR331/Forest Pkwy bn Pine & Oak Sts, Forest Park	13
Clayton	063-1192	I-75 bn 19/41 & Forest Parkway/Farmer's Market exit	11
Clayton	063-1201	I-285 E of I-75 & US19,41/Old Dixie Hwy, ATL, Clayton	11
Cobb	067-0774	I-575/SR417 N of I-75 Split, Marietta, Cobb Co	12
Cobb	067-2141	US-41/SR3/Cobb Pkwy S of Franklin Rd, Marietta	13
Cobb	067-2334	CR4516/Powder Springs Dallas Rd bn Finch Rd & Warren Farm Rd	12
Cobb	067-2623	SR280/S Cobb Dr @Dobbins AFB, S of Ridenour Rd	13
Cobb	067-2738	I-75 N of I-285 @Terrell Mill Rd SE, Marietta	11
Cobb	067-2749	I-75 S of I-575 Split, Marietta	8
DeKalb	089-0314	I-20 E of Panola Rd @Fairington Rd, ATL	8
DeKalb	089-0644	CS 757/Chamblee Tucker Rd E of SR13 @Catalina Dr, ATL	12
DeKalb	089-0927	I-675 S of I-285 @Cedar Grove Rd, ATL, MP 7/8	13
DeKalb	089-3323	I-85 bn SR400 Split & N Druid Hills Rd, ATL, MP 88/89	12
DeKalb	089-3332	I-85 bn I-285 & Chamblee Tucker Rd, ATL	11
DeKalb	089-3354	I-285 bn Memorial Dr & Church St. MP 44.4	15
Dekalb	089-3363	I-285: S of Chamblee-Tucker nr Henderson Mill	8
Dekalb	089-3438	CR 5156/Chamblee Dunwdy Rd N of SR141 @Colt Dr, ATL	13
Dekalb	089-3572	CS 517831/Dunwdy Club Rd E of Mt Vernon Rd, ATL	12
Dekalb	089-3638	CR 5182/Pleasantdale Rd @Lynray Dr/CR3325	13
Douglas	097-0107	I-20 E of SR61 & Liberty Rd @Tyson Rd, Villa Ricca	12
Fulton	121-0178	US-29/SR14 W of SR74 nr Johns Riv Rd, Fairburn	11
Fulton	121-0190	US-29/SR14 S of Alexander Ave, Union city, Fulton Co	13
Fulton	121-0458	US-19/SR400 N of Mansell Rd @Encore Pky, ATL	13
Fulton	121-0516	I-85/SR403 bn Flat Shoals Rd & I-285 MP 66.95	9
Fulton	121-5108	US-19/SR9/P'chtree Rd N of Collier Rd @RR Xing, ATL	11
Fulton	121-5110	US-19/SR9 S of W Wesley Dr near Lakeview Ave, Buckhead	11
Fulton	121-5114	US-19/SR9/Roswell Rd N of Lakemoore Dr, ATL	11
Fulton	121-5225	US-23/SR42/Moreland Ave N of McDonough Blvd	12
Fulton	121-5374	CR 4176/Cascade Rd bn New Hope Rd & Danforth Rd	12
Fulton	121-5450	SR400 S of I-285, ATL	13
Fulton	121-5463	I-75 S of I-85 Split & Cleveland Av, ATL	11
Fulton	121-5468	I-75 bn SR166 & University Ave	11
Fulton	121-5474	I-75/I-85 @ Grady Curve	15
Fulton	121-5486	I-75 @Northside Dr, ATL	12
Fulton	121-5505	I-20/SR402 W of I-75/85 @McDaniel St SW, ATL	11
Fulton	121-5508	I-20/SR402 E of I-75/85 & Capitol Ave @Hill St, ATL	13
Fulton	121-5524	I-85/SR403 S of I-75 Split @Cofield Dr, ATL	12
Fulton	121-5534	I-285/SR407 N of I-85 nr Washington Rd, ATL	12
Fulton	121-5555	I-285/SR407 E of SR54 @Forest Park Rd, ATL	12
Fulton	121-5633	US-19/SR9/14th St E of N'side Dr @Mcmillan St, ATL	11
Fulton	121-5969	I-85 N of I-75 Split @SR13/Buford Hwy Ramp, ATL	11
Fulton	121-6370	I-75/SR401 S of I-285 @Chattahoochee River, ATL	11

Figure 13. GeoCounts – Permanent Traffic Count Stations (ATR Location Map)

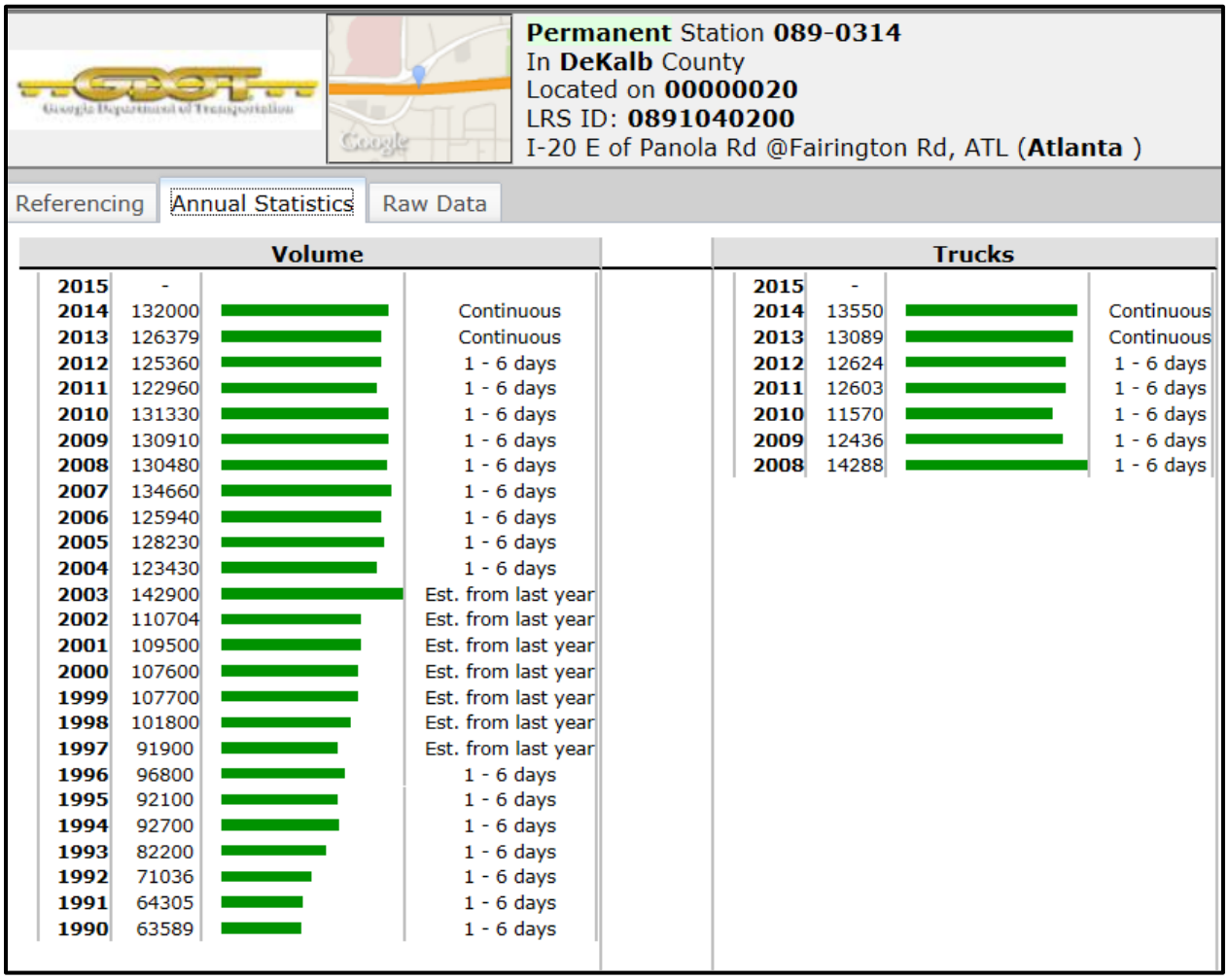


Figure 14. GeoCounts – Permanent Traffic Count Stations Sample Data

Monthly Volumes: Oct, 2014
Direction: All Directions

		12:00 am	1:00 am	2:00 am	3:00 am	4:00 am	5:00 am	6:00 am	7:00 am	8:00 am	9:00 am	10:00 am	11:00 am	12:00 pm	1:00 pm	2:00 pm	3:00 pm	4:00 pm	5:00 pm	6:00 pm	7:00 pm	8:00 pm	9:0 pm
Oct 01	Wed	1571	1035	905	1080	2016	5648	7057	7347	7013	6681	6666	6772	6824	7574	7961	6020	9584	9515	8569	6940	5902	4
Oct 02	Thu	2008	1121	906	1079	2021	5846	7059	7359	7056	6372	6876	6801	7276	7533	8479	9373	9625	9538	8554	7410	6086	4
Oct 03	Fri	1722	1188	995	1138	2047	5351	6826	7123	6992	6134	6426	7493	8039	8834	9884	9786	9950	10076	9772	8056	6701	5
Oct 04	Sat	2788	1836	1496	1330	1433	2226	3338	4639	6033	7233	7873	8092	8596	8463	8885	8745	8514	8289	7719	7284	6652	5
Oct 05	Sun	2634	1672	1267	1046	993	1287	1952	2708	3547	5160	6601	6968	7532	8540	8501	8375	8565	8301	7662	6915	5778	4
Oct 06	Mon	1403	942	780	979	2094	5762	7011	7329	6809	6433	6601	6658	6936	7241	8132	9070	8903	9762	8209	6381	4927	3
Oct 07	Tue	1402	906	774	985	2097	5712	6676	7279	6794	6417	6529	6331	6899	7130	8095	8969	8819	9337	8312	6712	5315	3
Oct 08	Wed	1514	972	915	1098	2123	5620	6883	7120	6906	6630	6509	6724	6863	7439	8215	9026	8838	9908	8513	6976	5515	4
Oct 09	Thu	1492	1074	924	1072	2041	5769	5064	6063	6922	6714	6592	7020	7417	8028	6995	9424	9309	8867	8361	7103	6126	4
Oct 10	Fri	1740	1204	1032	1159	2145	5363	6378	7052	6829	7284	7518	7927	8711	9342	10018	9807	9995	10147	9918	8592	7058	5
Oct 11	Sat	2846	1811	1484	1338	1499	2261	3077	4633	6025	7270	7591	8203	8495	8558	7848	8751	8578	8522	7927	7191	6420	5
Oct 12	Sun	2727	1912	1422	1184	1001	1362	2141	3214	4249	5769	6650	7163	8216	9089	8837	8422	8407	8085	7251	7157	6494	4
Oct 13	Mon	1634	983	776	1019	2127	5610	6813	6731	6300	6543	6835	7068	7341	7696	8288	9455	9875	9831	8248	6661	5072	4
Oct 14	Tue	1550	951	827	1003	2007	4848	5697	6081	5646	5752	5401	5781	6226	6082	6931	7847	8918	9122	7492	6085	4766	3
Oct 15	Wed	1471	956	817	992	2075	5428	6943	7598	6983	7010	6705	6916	7272	7805	8188	9028	9850	9892	8837	6958	5196	4
Oct 16	Thu	1686	1007	887	1028	2057	5695	7184	7574	7233	7010	6793	6934	7493	7831	8741	9460	10117	9941	8739	7335	5935	4
Oct 17	Fri	1743	1099	938	1133	2050	5275	6956	7081	6891	7010	7633	8074	8591	9491	10087	10111	8174	6779	9145	8985	7263	5
Oct 18	Sat	2639	1760	1356	1329	1475	2448	3461	4904	5892	7077	7678	8206	8476	8575	8909	9094	8843	8673	8179	7684	6435	5
Oct 19	Sun	2840	1978	1442	1233	996	1417	2133	3007	4081	5535	6682	6954	7885	8934	8867	8876	9165	8771	8025	7038	5790	4
Oct 20	Mon	1371	848	749	938	2116	5925	6944	6695	6905	6473	6615	6647	6989	7324	7894	8958	9564	9503	8246	6410	4762	3
Oct 21	Tue	1372	952	767	1015	2014	5648	6863	7027	6763	6638	6314	6426	6806	7418	7751	8999	9368	9317	8333	6892	5128	4
Oct 22	Wed	1410	960	827	992	2043	5671	6863	7041	6876	6892	6605	6712	7052	7433	8404	9083	9423	9625	8663	7156	5473	4
Oct 23	Thu	1532	975	813	1076	2025	5594	6846	7079	7009	6833	6871	7017	7259	7948	8645	9213	9030	9971	8994	7384	5909	4
Oct 24	Fri	1618	1124	937	1125	2084	5344	6816	6843	6801	7101	7316	7939	8425	9158	10123	10191	9760	9749	9647	8555	6766	5
Oct 25	Sat	2554	1743	1232	1221	1334	2188	3440	4878	5885	6860	7460	8276	8628	8865	8901	9046	8762	8177	8306	7554	6424	5
Oct 26	Sun	2671	1755	1386	1156	1020	1335	1978	2748	3828	5467	6637	6828	7575	9012	8937	8940	9080	8364	8068	7120	5615	4
Oct 27	Mon	1316	849	759	998	2187	5912	7167	7242	6845	6840	6598	6600	6993	7305	8165	8729	9293	9486	8124	6510	4720	3
Oct 28	Tue	1410	860	764	1010	2070	5647	6841	7189	6855	6473	6248	6449	6520	7170	7924	9063	9409	9766	8374	6572	5049	4
Oct 29	Wed	1366	963	855	1063	2050	5653	6938	7294	6856	6636	6408	5766	5688	6327	7987	8863	9549	9706	8529	6491	5209	4
Oct 30	Thu	1485	981	847	1074	2090	5818	6898	6953	7118	5177	6696	6769	7203	7868	8465	9594	9499	9806	9039	7632	5987	4
Oct 31	Fri	1724	1219	939	1240	2050	5311	6814	6832	6921	6847	7206	7993	8561	9607	10180	10389	10160	9853	8976	7403	6201	5
	Average	1846.4	1214.1	994.1	1101.1	1851.0	4612.1	5711.5	6214.9	6350.4	6524.9	6810.7	7080.9	7509.3	8052.3	8556.0	9055.1	9255.7	9247.7	8475.2	7198.1	5828.2	464
	Weekday	1545.2	1007.3	858.0	1056.3	2070.8	5584.8	6762.5	7040.5	6840.1	6604.3	6694.0	6905.1	7277.6	7808.0	8502.3	9150.3	9435.3	9543.3	8678.0	7182.6	5698.5	454
	Weekend	2712.4	1808.4	1385.6	1229.6	1218.9	1815.5	2690.0	3841.4	4942.5	6296.4	7146.5	7586.2	8175.4	8754.5	8710.6	8781.1	8739.2	8397.8	7892.1	7242.9	6201.0	496

Figure 15. GeoCounts – Hourly Traffic Data Truck Traffic Reports

Georgia Department of Transportation
Office of Transportation Data

2013 Truck Percentages by Location

County	TC	Location	Avg Truck %	Single Unit Truck%	Combin-ation Unit Truck%	AADT	RT	Route Num	YEAR
APPLING	0183	SR169:bn Wayne Co Line & SR121	17.2	5.1	12.2	870	SR	016900	2013
APPLING	0185	Red Oak Rd/CR531:bn SR203 & Cameron Rd CR165	15.0	7.8	7.3	520	CR	053100	2013
ATKINSON	0132	US82/SR520: W of US221 bn CR244 & CR129, Pearsn, Atknsn Co.	25.1	5.7	19.7	4,370	SR	052000	2013
ATKINSON	0138	US82/SR520: 0.8 mi E of SR31/US221, Pearson, Atkinson Co.	24.7	4.9	19.7	4,110	SR	052000	2013
BACON	0125	US1/SR4:4 mi North of Alma	19.5	6.0	13.5	4,500	SR	000400	2013
BALDWIN	0156	SR22,24: E of Fairview Rd near SR22/24 Split, Milledgeville, GA	8.1	3.5	4.7	8,630	SR	002400	2013
BANKS	0103	US441/SR15:bn Banks & Hollow Dr	7.1	4.5	2.7	10,970	SR	001500	2013
BARROW	0036	CR415/Atl Hwy E of SR8/53 bn Giles & Hardigree Rds, Winder	4.8	3.4	1.4	8,020	CR	041500	2013
BARTOW	0118	US41/SR3 Cartersville: bn Grassdale Rd. & SR 61	5.7	3.3	2.5	41,480	SR	000300	2013
BARTOW	0178	SR61: bn SR20 (Canton Hwy) & I-75	8.3	4.7	3.6	9,380	SR	006100	2013
BARTOW	0276	I-75/SR401: just above SR20	24.7	4.8	20.1	66,240	SR	040100	2013
BEN-HILL	0143	SR11: bn SR11 South N. Grant St & Bush Av CS629	5.7	4.2	1.6	3,510	SR	001100	2013
BIBB	0116	US80/SR22: bn Crawfrd Co Line & Columbs Rd, Lizella, GA	6.6	3.1	3.5	4,370	SR	002200	2013
BIBB	0132	US80/SR22: E of SR-74Sp/Log Cabin Dr, Macon, Bibb Co.	3.6	2.6	1.0	21,310	SR	002200	2013
BIBB	0158	US129/SR11 (Hawkinsville Rd): N of Spires Dr near Hangar Rd	7.0	3.9	3.1	25,560	SR	001100	2013
BIBB	0258	SR247:bn Industrial Pkwy & Avondale Mill Rd	5.1	3.0	2.1	22,210	SR	024700	2013
BIBB	0267	US41/SR247: bn Pio Nono Cir & Spencer Cir	3.0	2.6	0.4	16,050	SR	024700	2013
BIBB	0334	I-75: bn I-475 & SR247 Pio Nono/Jennifer Overpass	8.2	3.3	4.9	33,090	SR	040100	2013
BIBB	0349	I-75: bn Georgia Av & I-16	7.1	3.2	3.9	70,770	SR	040100	2013
BIBB	0365	I-16/SR404: bn I-75 & Spring St				78,550	SR	040400	2013
BIBB	0372	I-16: bn Coliseum Dr & SR87				44,070	SR	040400	2013
BIBB	0376	I-16:bn SR87 & Twiggs Co Line	19.6	3.5	16.1	22,190	SR	040400	2013
BIBB	0378	I-475/SR408: bn I-75 & SR22 South of SR22	19.5	3.5	16.0	53,830	SR	040800	2013

Figure 16. Truck Traffic Reports

Table 2-1: Forecast Population Growth by County 2000-2040

County	Population			
	2000	2040	Total Change	Percent Change
Cherokee	141,903	402,995	261,092	184.0%
Clayton	236,517	325,026	88,509	37.4%
Cobb	607,751	849,933	242,182	39.8%
DeKalb	665,865	925,017	259,152	38.9%
Douglas	92,174	257,034	164,860	178.9%
Fayette	91,263	187,968	96,705	106.0%
Fulton	816,006	1,337,248	521,242	63.9%
Gwinnett	588,448	1,159,795	571,347	97.1%
Henry	119,341	433,984	314,643	263.7%
Rockdale	70,111	162,961	92,850	132.4%
Total 10-County Region	**3,429,379**	**6,041,961**	**2,612,582**	**76.2%**
Barrow	46,144	133,072	86,928	188.4%
Bartow	76,019	169,990	93,971	123.6%
Carroll	87,268	191,989	104,721	120.0%
Coweta	89,215	249,997	160,782	180.2%
Forsyth	98,407	390,056	291,649	296.4%
Hall	139,277	349,995	210,718	151.3%
Newton	62,001	202,044	140,043	225.9%
Paulding	81,678	285,101	203,423	249.1%
Spalding	58,417	115,012	56,595	96.9%
Walton	60,687	155,025	94,338	155.5%
Total 20-County Region	**4,228,492**	**8,284,242**	**4,055,750**	**95.9%**

Figure 17. Census Population Data (example)

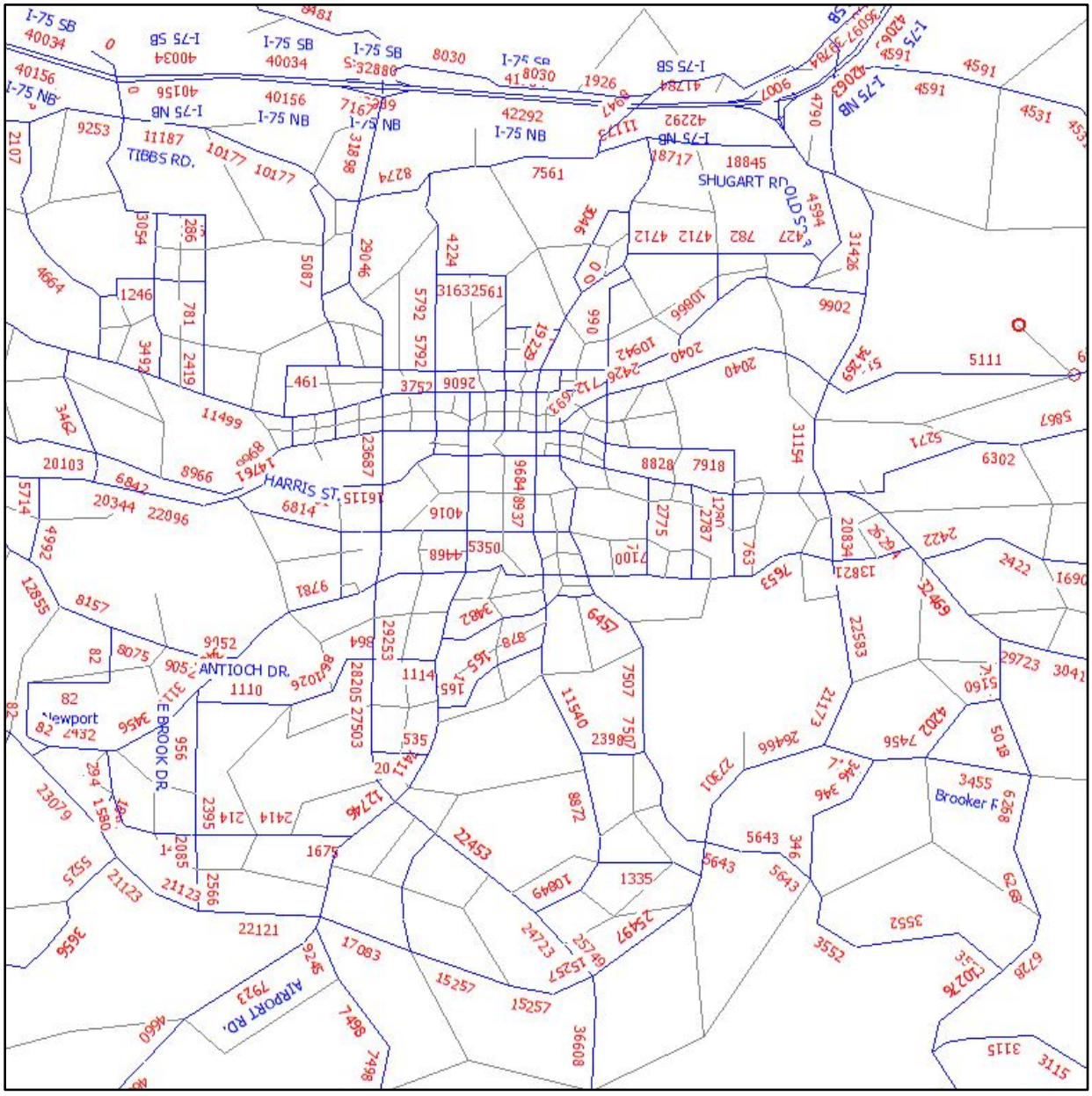


Figure 18. Travel Demand Model Data